INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS

T—350XM

RADIOTELEPHONE—RADIOTELEGRAPH

TRANSMITTER SYSTEM

AUTODYNE ENGINEERING AND MANUFACTURING CO.

BETHPAGE, NEW YORK

U.S.A.

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Radiotelephone-Radiotelegraph

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INTRODUCTION:

This manual has been prepared for the following contract:

"Central Purchasing Authority
Co-Quam Mai-Dich, Saigon, Vietnam
P10/C 430-71-120-9-90831
Contract Number 0105-01021"

A complete high power Amplitude Modulated Transmitter system is supplied including all necessary equipment for radio transmission. This includes the following equipment:

(1) Transmitter
(2) Speech Console with Phone Patch
(3) Power Transformer and Circuit Breaker
(4) Cables, Microphone, Hand Key, Crystals and Spare Parts

In order to provide complete station facilities the following additional equipment must be supplied. However, this equipment is not a part of this contract.

(1) Radio Receiver, AM, Type 75S2
(2) Multiband Antenna
(3) Power Source, 115 volts A.C. (2.5 KVA)
(4) Speaker

This manual has been prepared in a logical sequence to assist in installation, operation and maintenance of the equipment. Careful attention has been given to explaining the step by step sequence from the receipt of the equipment to the installation and final daily operation of the system. It is expected that a technically trained crew will assemble and set up the transmitter system. The following tasks mustbe performed:

First a complete group of equipment should be assembled together. As noted in the installation and packing details, some of this equipment has been multiple packed. For example, circuit breaker boxes, power transformers, cable boxes etc. Other operations include installation of tubes and crystals in the Transmitter. The low voltage power supply and modulation transformer must be installed and connected within the transmitter. The circuit breaker panel must be connected to station power. Interunit cabling (17 cables) must be routed and connected. This crew should complete the system installation and provide operating training to the user personnel.

TECHNICAL SUMMARY

TRANSMITTER ELECTRICAL CHARACTERICS

Frequency range.....2,000-20,000 kcs
Power output:
Radiotelegraph.....350 watts
Radiotelephone.....250 watts
Type of modulation.....Class B, High Level
Audio input impedance.....500 ohms
Audio input level for 100 percent modulation.....+40 vu
Power supply requirements.....210 to 250 volts, 50-60 cycle

POWER CONSUMPTION:

Radiotelegraph.....1650 watts
Radiotelephone(100% modulation).....1800 watts

TUBE LINE-UP:-

Master oscillator.....1, 6SJ7, 1, 6SK7
Crystal oscillator.....1, 6J5
First, Buffer-Doubler.....1, 807
Second, Buffer-Doubler.....1, 807
Final Amplifier.....2,813's
Modulator.....2,805's
Bias supply regulator tube.....1, VR-150
Master oscillator regulator tubes.....2,VR-105's
High voltage rectifiers.....4,866's
Low voltage rectifiers.....2,5Z3's
Keying tube.....1,6L6G

MECHANICAL:

Height (over supporting channels).....58½"
Width.....16"
Depth.....24½"
Weight, (net).....Approx, 690 pounds

SPEECH CONSOLE

ELECTRICAL CHARACTERISTICS:

Frequency Range.....300 - 3500 Cycles
Power Output.....12 Watts, Class A
Audio Output Impedance.....500 OHMS
Audio Input Impedance.....250/30 OHMS

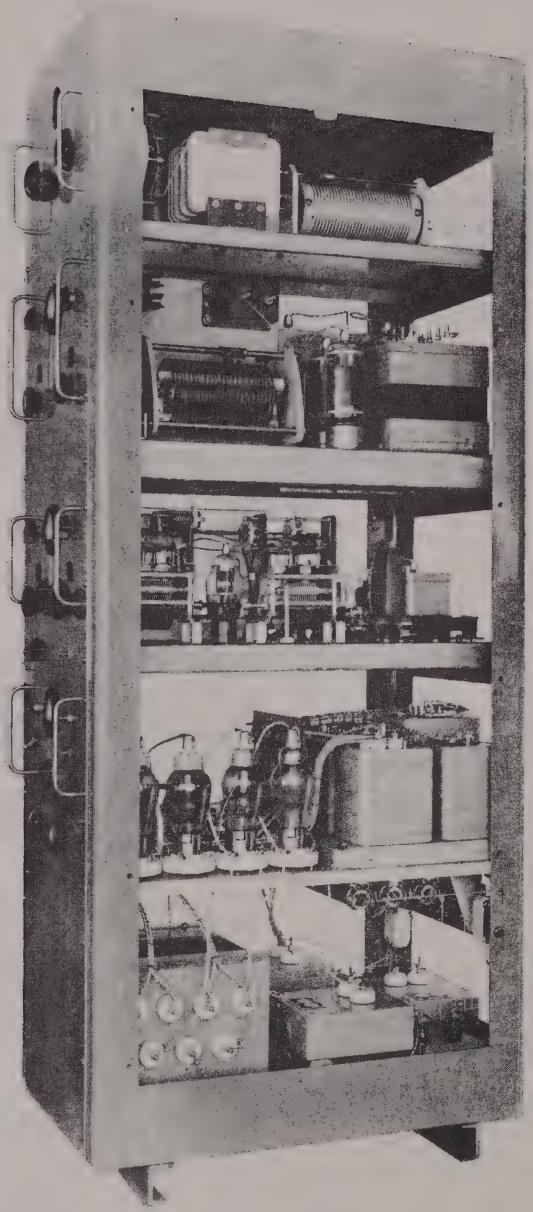
POWER CONSUMPTION 250 watts

TUBE LINE-UP

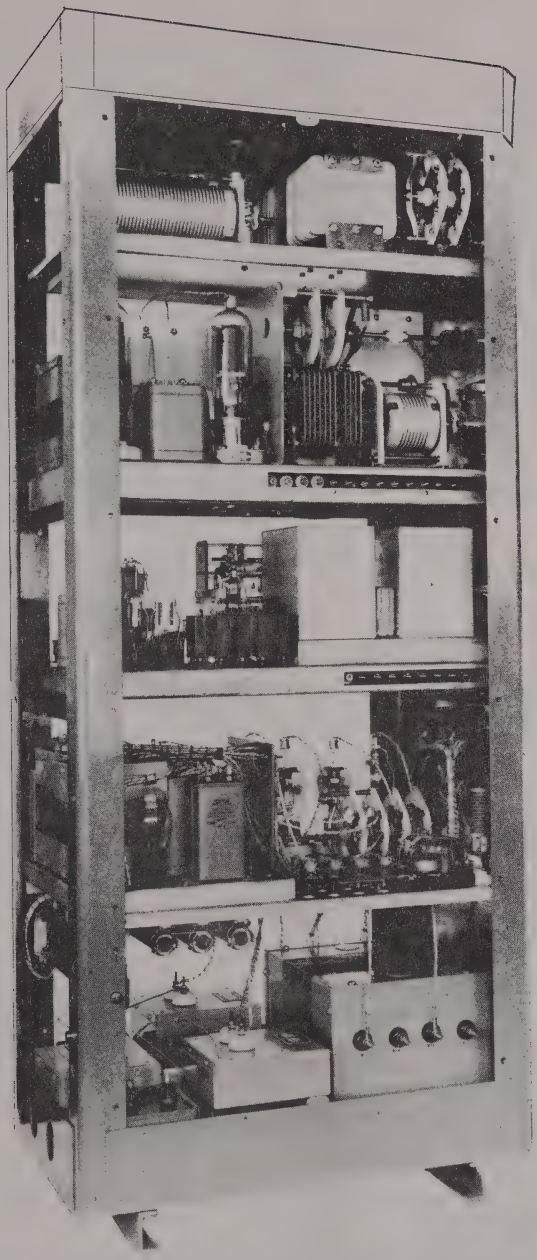
Voltage Amplifiers	V-1,V-2	2 each	6J7
Limiter	V-101	1 "	6AL5
Phase Inverters	V-3,V-4	2 "	6J7
Power Amplifiers	V-5,V-6	2 "	6L6GA
VOX/AVOX Amplifier	V-102A&B	1 "	12AT7
VOX/AVOX Rectifier	V-103A&B	1 "	6AL5
VOX Relay/Sidetone Oscillator	V-104A&B	1 "	12AT7
Rectifier	V-7	1 "	5U4G

MECHANICAL: (With Phone Patch)

Height	9"
Width	20"
Depth	13"
Weight	35 Lbs.



Side view—T-350XM.



Side view—T-350XM.

DESCRIPTION

GENERAL:

The T-350XM Transmitter System is designed for either radiotelephone or radiotelegraph operation within the frequency range from 2,000 to 20,000 KCS. Frequency control is by means of either quartz crystals, (five crystal positions are available) or from a built-in master oscillator.

Type of keying employed: Vacuum tube for automatic keying at speeds up to 100 words per minute.

Power output is nominally 350 watts on radiotelegraph, 250 watts on radiotelephone throughout the full frequency range of the equipment.

TRANSMITTER CONSTRUCTION:

The general appearance and construction of the transmitter and speech console are shown in the accompanying front and side view photographs and block diagram. The arrangement of the various chassis and components is as follows:

1. Transmitter:

Bottom of Housing Case:

High voltage power supply including chokes and filter condensers for final amplifier and modulator.

Side Channels: (Left hand side, front panel reference)

Four 866 rectifier tubes.

The two nearest the front panel are for the final amplifier high voltage.

The two farthest removed from front panel are for the modulator.

Deck Supported on Rear of Side Channels:

Low voltage power supply including rectifier tubes and filter.

Filament transformer, 6.3 volt, 6 amp.; 5 volt, 6 amp.
Filament transformer, 10 volt, 8 amp.; 10 volt, 10 amp.
Filament transformer, 2.5 volt, 10 amp.; 2.5 volt, 10 amp.

First Deck: (Bottom Reference)

Master oscillator.
Five crystal channels and crystal tube.
First, buffer-doubler.
Second, buffer-doubler.
Bias supply including transformer, rectifier and filter.
Keying relay.
Vacuum tube keyer.
Voltage regulator tubes for master oscillator. (2 Tubes)
Voltage regulator tube for bias supply.

Second Deck: (Bottom Reference)
Final amplifier-modulator.
Including modulation and Class B driver transformers, two type 805 modulator tubes, two type 813 final amplifier tubes and radio frequency tuning circuits.
Top Deck:
Antenna network: Including variable inductor, fixed airdielectric capacitors and associated switches.

2. Speech Console:
Amplifier Chassis:
B+ Power Supply including chokes and filter condensers.
Speech amplifier tubes and limiter circuits.
Input and output transformers.
VOX Control Circuits.
Anti-VOX Control Circuits.
Sidetone oscillator.
Phone Patch Chassis:
Mike/Phone switch
Gain and Null circuits

3. Auxiliary Equipment:
Cables (17)
Microphone
Key
Antenna Relay
Power Transformer with Circuit Breaker box

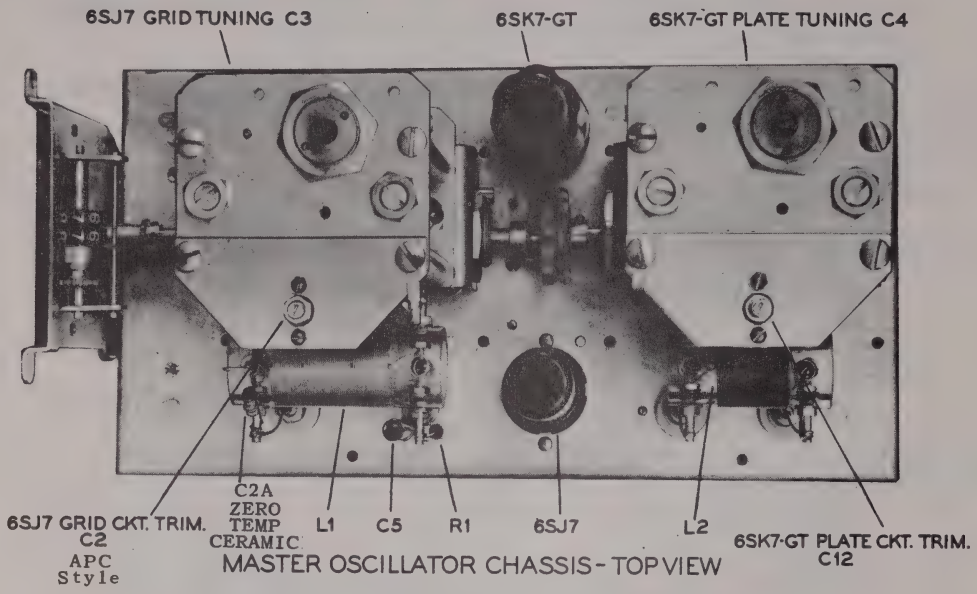
TRANSMITTER CIRCUIT DESCRIPTION:

The block diagram should be consulted to acquaint the operator with the general line-up of the transmitter and the circuit description following. Note that basically the radio frequency portion consists of:

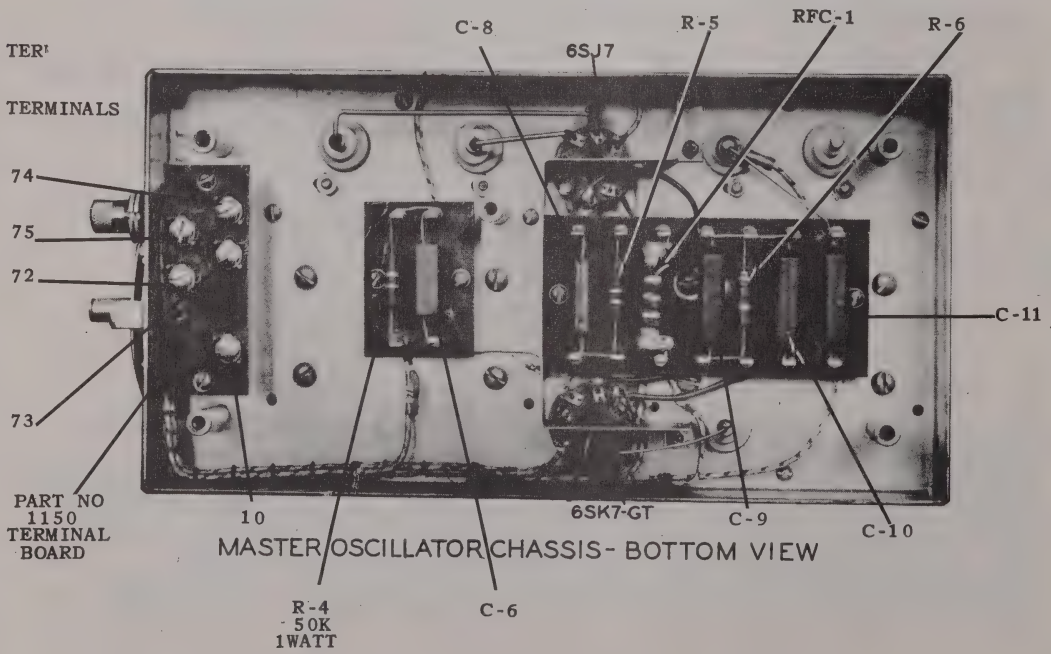
1. Frequency control. This may be either from the master oscillator or any one of five crystal positions.
2. First buffer-doubler stage.
3. Second buffer-doubler stage.
4. Final amplifier.
5. Antenna network.

1. Master Oscillator:

The master oscillator utilizes a special type of circuit which permits a high degree of isolation between the frequency determining grid circuit (6SJ7) and the buffer and final amplifier stages. Actually this oscillator consists of the conventional electron coupled grid circuit with cathode tap feedback wherein the plate circuit of the 6SJ7 oscillator tube is untuned. Resistance coupling is employed to feed the energy from this plate circuit to the grid of the isolation stage. Note that



MASTER OSCILLATOR CHASSIS - TOP VIEW



MASTER OSCILLATOR CHASSIS - BOTTOM VIEW

the oscillator grid circuit and the first isolation stage plate circuit are tuned by the same control. Tuning condensers, C3 and C4 are ganged together to make this possible. Tracking of the two tuned circuits is accomplished by careful factory matching of inductances as well as by the parallel trimming condensers C2 and C12. These two condensers are used to balance stray and minimum capacitances at the high frequency end of the tuning range. The grid circuit of the oscillator stage is at one-half the frequency of the plate circuit of the isolation stage. In other words, the isolation stage always works as a frequency doubler. In this manner changes in plate circuit parameters in the isolation stage have negligible effect upon the oscillator grid circuit and hence upon oscillator frequency.

The master oscillator covers the frequency range from 2,000 to 4,000 kcs. This of course applies to the output of the isolation stage which should be considered as the plate circuit of the oscillator. As mentioned, the oscillator grid circuit is at half frequency or 1,000 kc. to 2,000 kc. The entire frequency range of the transmitter, 2,000 to 20,000 kcs., is covered from the basic 2,000 to 4,000 kc., output from the master oscillator by the use of a suitable frequency multiplication supplied by the buffer-doubler stages.

2. Crystal Oscillator:

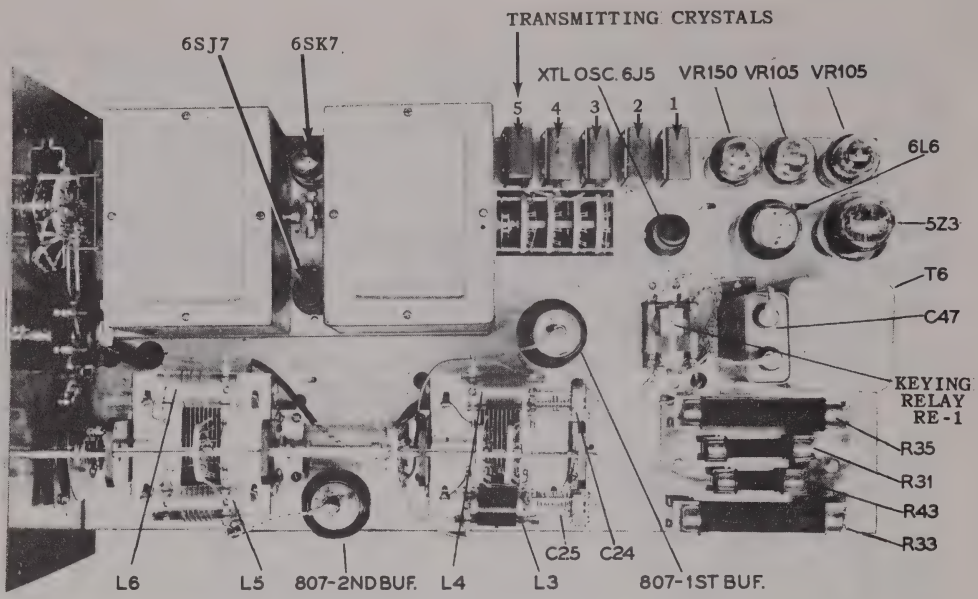
The circuit used in the crystal oscillator positions is of the untuned or "Pierce" type. When quartz crystals are used for frequency control the only requirement is that a crystal of the proper frequency be used. The crystals required are of the fundamental type and will lie within a frequency range from 2,000 to 4,000 kc. for the full 2,000 to 20,000 kc., range of the transmitter. All necessary frequency multiplication is accomplished in the buffer-doubler stages.

3. Buffer-doubler stages:

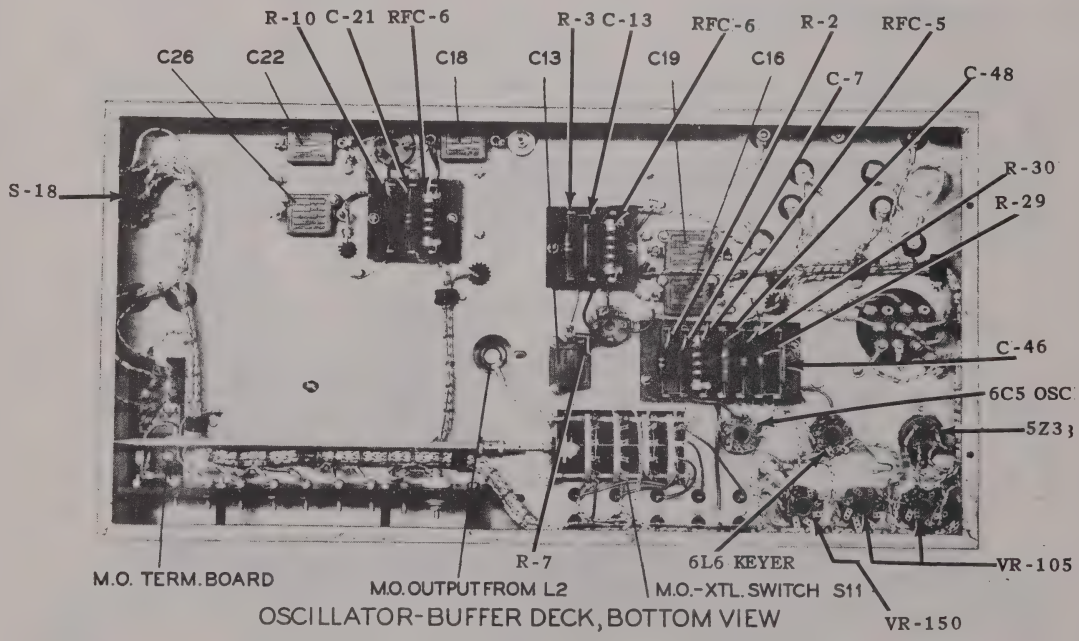
Note from the block diagram that either one or both buffer-doubler stages can be put into the circuit by the buffer range SW-14-15-16-17. In Band #1 (2,000 to 4,000 kc.), only one of the 807's is used. In this instance the stage operates as a straight-through amplifier. The second stage is inoperative in this position.

On Band #2, (4,000 to 8,000 kc.), the first 807 operates as a frequency doubler giving an output frequency of 4,000 to 8,000 kc. from an oscillator output of 2,000 to 4,000 kc. The second 807 remains inoperative.

On Band #3 (8,000 to 16,000 kc.), the first 807 continues to operate as a frequency doubler. The second 807 is now switched into the circuit and operates as an additional frequency doubler to provide excitation voltage at 8,000 to 16,000 kc.



OSCILLATOR-BUFFER DECK, TOP VIEW



OSCILLATOR-BUFFER DECK, BOTTOM VIEW

On Band #4 (16,000 to 20,000) the first 807 again operates as a frequency doubler, (4,000 to 8,000 kc.) whereas the second 807 now operates as a frequency tripler to provide output at 16,000 to 20,000 kc. Note that in this instance the full two to one frequency ratio is not used. Actually, the multiplying stages will produce output to 24,000 kc., but since the final amplifier range ends at 20,000 kc., this extension of the range of the exciter stages serves no useful purpose.

Both 807 buffer-doubler stages are tuned from a single control since both tuning condensers, C17 and C23 are on a common shaft. Tracking on the low frequency end of the band is accomplished by careful factory adjustment of inductances. Minimum and stray capacitances are matched at the high frequency band edges by parallel padders, C24 and C25. Metering for the oscillator-buffer stages is accomplished by a milliameter, (0-100 ma) mounted on the front panel. The meter may be switched to read first buffer plate, second buffer plate and final amplifier grid currents. The meter is simply switched across resistors connected in series with the circuits to be metered. The value of these resistors is high in relation to the internal resistance of the instrument hence the error due to the shunting resistor is entirely negligible.

Note that in both buffer stages, metering is accomplished in the cathode circuits. The meter thus is actually showing total cathode current, (a combination of plate, screen and grid currents).

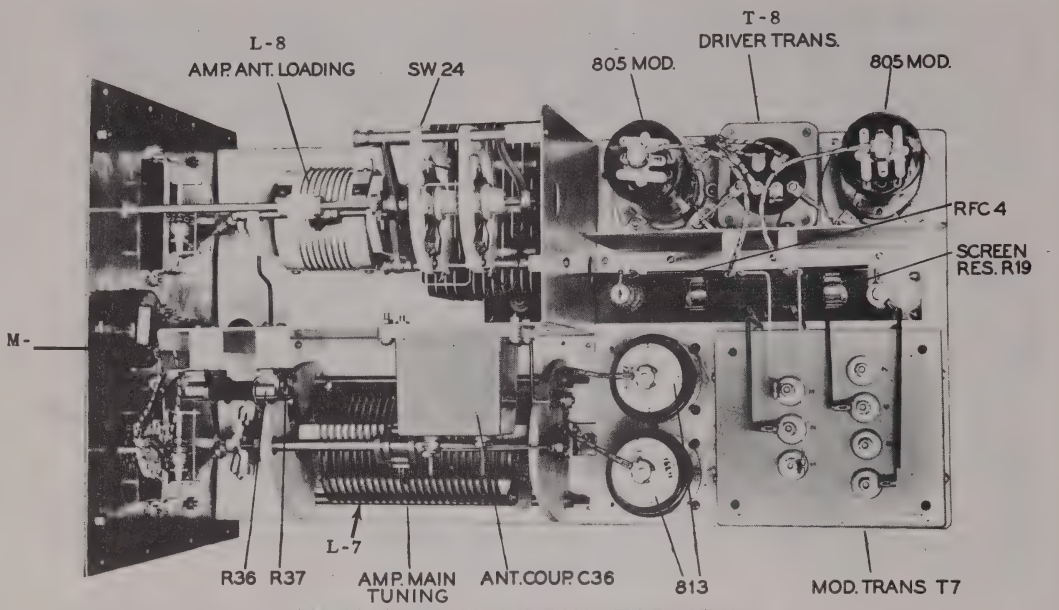
BIAS FOR BUFFER-DOUBLER STAGES. KEYING TUBE OPERATION:

The keying tube, (6L6GA) is connected in series with the cathode lead from the first buffer-doubler (807). When the plate current of the keying tube is cut-off by the application of negative voltage from the bias supply, the plate resistance rises to a value such as to prevent cathode current flow in the buffer-doubler stage. When the negative bias is removed from the keying tube, cathode current will again flow in the buffer-doubler stage thus permitting normal operation.

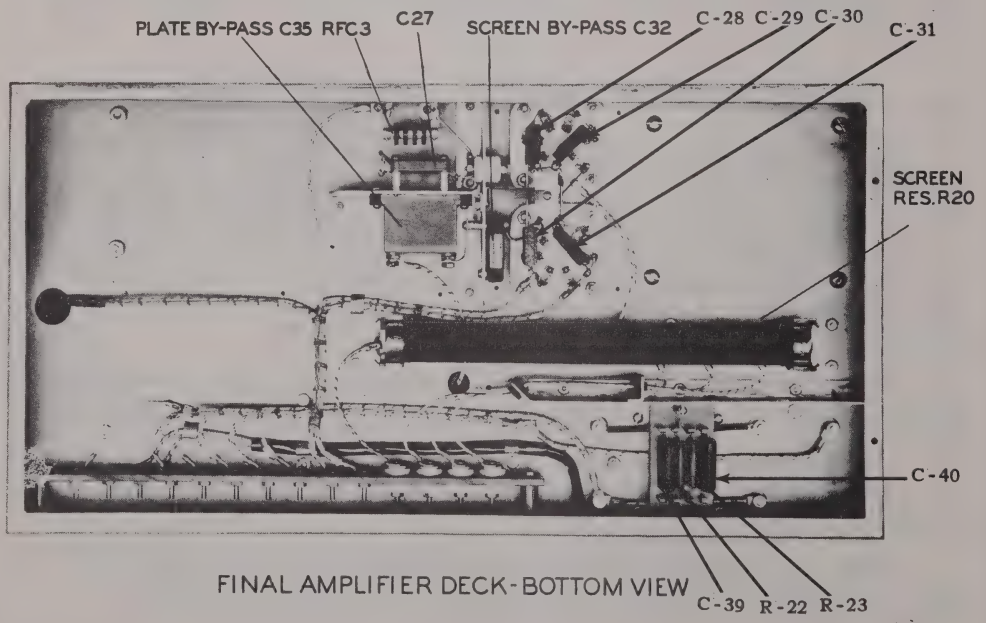
Note that fixed bias will be supplied to the buffer-doubler stage by the normal voltage drop existing across the keying tube.

Fixed bias for the second 807 buffer-doubler is supplied directly from the bias supply.

When determining exact bias, account must be taken of voltages applied to the grids by the voltage drop across individual grid resistors: (Due to grid current flow).



FINAL AMPLIFIER DECK - TOP VIEW



FINAL AMPLIFIER DECK - BOTTOM VIEW

Final Amplifier:

The final amplifier uses two type 813 tubes, parallel connected. The mechanical and electrical design of this stage is such that oscillation, either transient or sustained, is absent. This effect is basically achieved by proper shielding and common grounding-point returns. It is significant to note that the plate by-pass condenser C35 does not return directly to ground, (conventional practice) but instead returns through the screen by-pass capacitor C32.

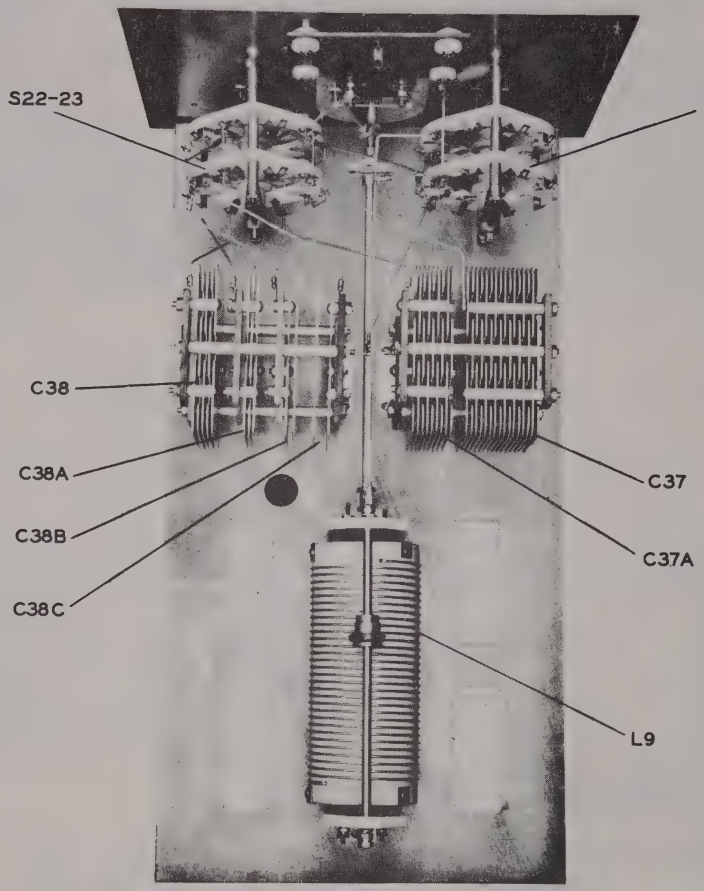
The two 813's are biased for Class C operation, cut-off voltage being supplied by the bias power supply. This stage is arranged so that plate and screen currents will drop to zero if the excitation voltage is removed. On radiotelegraph operation, (CW) the excitation voltage from the buffer-doubler stages over comes the fixed cut-off bias when the keying circuits are closed, thus permitting normal plate and screen currents to flow in the final amplifier. This means that on C. W. operation, plate and screen voltages will be on the final amplifier at all times when the main power switch is "ON", regardless of whether the keying circuits are open or closed.

Note in the circuit diagram of the final amplifier that when in the C.W. position, the screens of the 813's are supplied from the low voltage, (580 volt) supply. When so connected, the screen voltage of the final amplifier is prevented from rising excessively regardless of change of screen current under conditions of keying. Note further that an additional series screen dropping resistor, R19 is used to reduce the screen voltage from 580 to approximately 400 volts. When the amplifier stage is modulated on PHONE position, modulation of the screens simultaneously with the plates becomes necessary. The phone C.W. switch thus changes over the 813 screens to the modulated high voltage. This voltage is reduced to proper value by resistors R19 and R20. Since on PHONE position the excitation remains on and screen current flows at all times, it will be impossible for the screen voltage to rise to the same level as the voltage on the plates. Note that R19 remains in the screen circuit on both PHONE and C.W. positions.

FINAL AMPLIFIER RADIO FREQUENCY TUNING CIRCUIT:

In the T-350XM Transmitter the final amplifier is tuned by means of an L/C circuit, wherein the variable element is a rotating inductance. As the inductor is rotated by the dial on the front panel, a sliding contact shorts out a portion of the coil turns thereby changing the inductance. A suitable L/C ratio is maintained by the use of a fixed, air dielectric condenser. By means of SW24-25 three capacity selections are possible:

a. High capacity (used for lower frequencies).



ANTENNA NETWORK – TOP VIEW

b. Low capacity (used on intermediate high frequencies).
c. Capacitor out of circuit (for highest frequency).

By a combination of roller coil inductance and fixed capacity it is possible to cover the frequency range from 2,000 to 20,000 kcs.

An additional roller coil having a small number of turns serves as a means of coupling the final amplifier to the antenna network. The small and the large inductor are series connected with the antenna tap point occurring at the junction of the two coils. Since the two coils are rotatable independently, it becomes possible to vary the antenna coupling tap by adjusting the turns ratio of the two coils.

Antenna Network:

The antenna network in the T-350XM transmitter is designed to match impedances ranging from a few to several hundred ohms. Basically, the arrangement consists of a continuously variable inductor, (Roller-coil type) and several capacities of air dielectric condensers. The fixed condensers are connected to a capacity range selector switch SW22-23 so that as this switch is rotated, various condenser sections can be connected into the circuit. Note further that all sections are of different capacities. By means of SW-20-21 the fixed condensers can be connected to the variable inductor in the following manner:

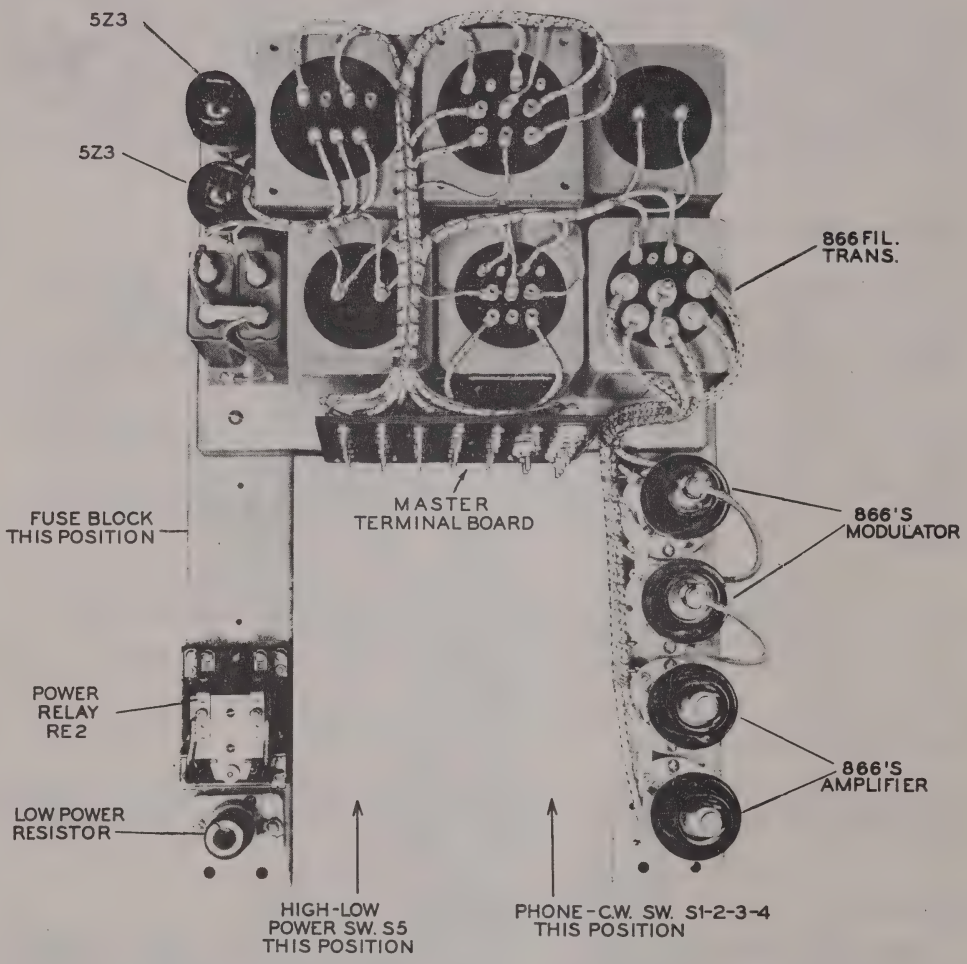
a. Condensers connected in series with variable inductor.
b. Condensers connected across variable inductor and ground so as to form a pi network.
c. Condenser completely removed from the circuit.

The antenna ammeter is permanently connected in series with the antenna lead.

This network is designed to work only into unbalanced antenna or transmission line arrangements where one side is grounded.

Modulator:

Two, type 805 tubes are used as the modulator. These tubes are operated in conventional Class B and with the plate voltage used, (1250 volts) require no bias. Modulation and Class B driver transformers are mounted on the final amplifier chassis. Input impedance for the Class B driver transformer in 500 ohms.



LOW VOLTAGE POWER UNIT AND SUPPORTING CHANNELS

Power Supplies:

HIGH VOLTAGE SUPPLY:

The high voltage power supply furnishes voltage for both modulator and final amplifier. The high voltage transformer has a secondary winding with three sets of taps, symmetrical either side of a common center-tap. The two outsides of the winding represent the highest voltage and two of the 866 rectifier tube plates are connected to these taps when the PHONE-CW switch is in C.W. position. When on the PHONE position, the two 866 supplying the final amplifier move to the next lower taps thus reducing the plate voltage. The two 866 supplying the modulators are connected to the lowest voltage taps on the transformer.

Both final amplifier and modulator rectifiers have separate filament windings since each has its own filter. The two windings are on a single transformer T2. This filament transformer is mounted on the low voltage power supply chassis along with the other filament transformers.

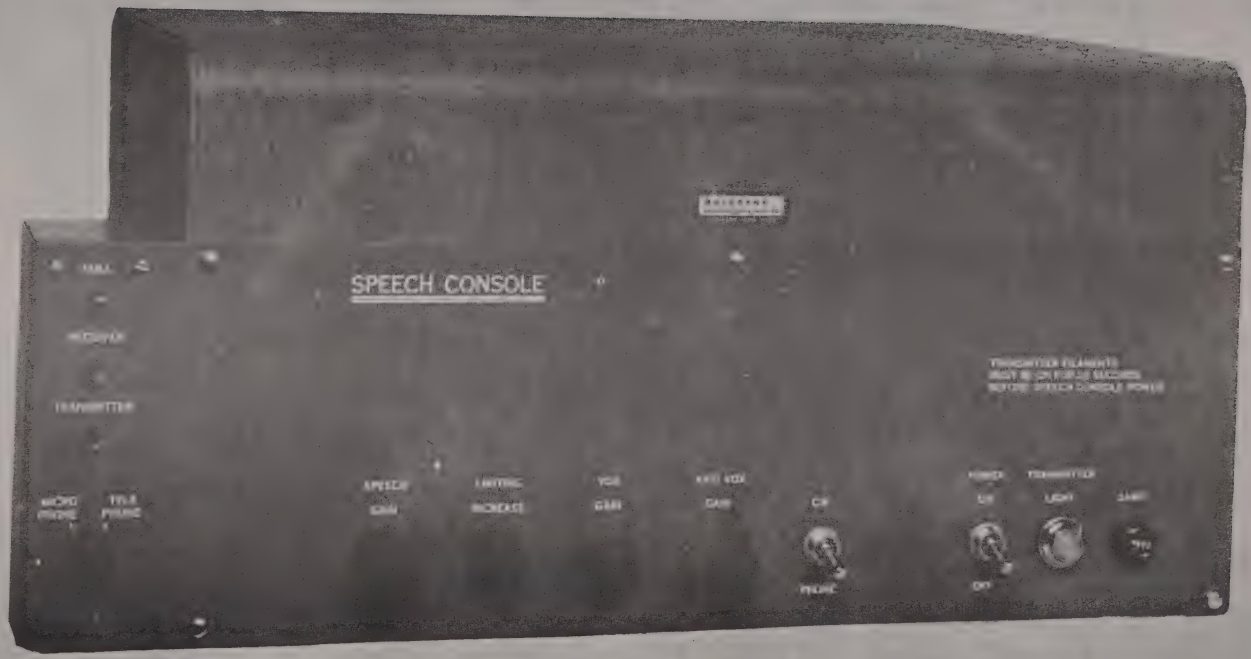
The final amplifier high voltage filter consists of an input choke, CH1, a 4 mfd., condenser, C42, a smoothing choke, CH2 and two 4 mfd., condensers C43, C43A, in parallel. The bleeder connected across the filter output consists of two ferrule-type resistors R25 and R27.

The modulator high voltage filter consists of an input choke, CH3 and a 10 mfd., filter condenser, C41. The bleeder resistor is of the ferrule type, R24.

Note that all three bleeder resistors are mounted underneath and between the two side channels, directly beneath the low voltage power chassis.

Low Voltage Supply:

The low voltage supply consists of power transformer T5 into a pair of 5Z3 rectifiers. The two plates of individual tubes are connected in parallel; the combination being connected for conventional full-wave operation. The filter consists of input choke CH4, filter condenser C45, smoothing choke CH5, and output condenser C44. R33, R34 and R43 in the buffer deck constitute the bleeder resistance for this supply.



FRONT VIEW OF THE SPEECH CONSOLE

Bias Supply:

The bias supply is mounted on the oscillator-buffer deck and consists of the following:

Power transformer into 5U4G rectifier connected in full wave. Filter condenser C47 in conjunction with resistor R31 and the VR150 tube constitute the filter. No filter choke is necessary.

Constant 150 volt bias is achieved by the use of the voltage regulator tube VR-150.

This bias supply furnishes bias voltage for the final amplifier grids, to the second doubler, (807) and to the grid of the keying tube, 6L6GA.

Keying:

As previously mentioned, the T-350XM Transmitter has provisions for high speed keying. This is accomplished by keying tube 6L6GA. The stage is keyed when the keying tube grid is grounded

SPEECH CONSOLE CIRCUIT DESCRIPTION

General

The circuit diagram should be consulted to acquaint the reader with the details of circuit operation. The speech console is composed of the following basic circuitry assemblies:

1. Phone Patch
2. Audio amplifier, phase inverter, and power amplifier
3. Audio voltage limiter
4. VOX Amplifier, rectifier
5. Anti-VOX Amplifier, rectifier
6. Antenna relay amplifier tube and relay
7. Sidetone oscillator
8. Power Supply components

1. Phone Patch

The basic purpose of this block of circuits is to:
(1) Enable the selection of the source of audio signals (microphone or telephone)
(2) Provide balancing and gain controls when the telephone is the selected source of signals.

REAR VIEW OF SPEECH CONSOLE

When S201, the patch selector switch, is placed in the microphone position, the microphone signal voltage is fed directly into the speech console. Also the system speaker is connected to the 75S2 receiver; thus enabling station operation with voice signals from the microphone modulating the transmitter at the transmission frequency, and reception of a remote station by the receiver and heard through the station loud speaker.

When the patch selector switch, S201, is placed in the telephone position, it utilizes a hybrid transformer bridge circuit which will automatically transfer any signal from the 75S2 receiver to the telephone lines, enabling listening to the received signal in telephone receiver element; and allows the signal originated by telephone transmitters attached to the telephone line to modulate the T350XM transmitter. Thus, communication is made in this mode with any number of remotely stationed telephone sets.

The circuit provides a high degree of isolation between the 75S2 receiver output and the speech console input circuits, making possible send/receive situations without the need for manual switching. It incorporates separate Receiver and Transmitter gain controls R207 and R205, eliminating the need for adjusting station speech gain and receiver gain controls when switching from the microphone position to the telephone position and back again. A NULL control, S204, is provided to allow optimum adjustment of isolation between transmitter and receiver.

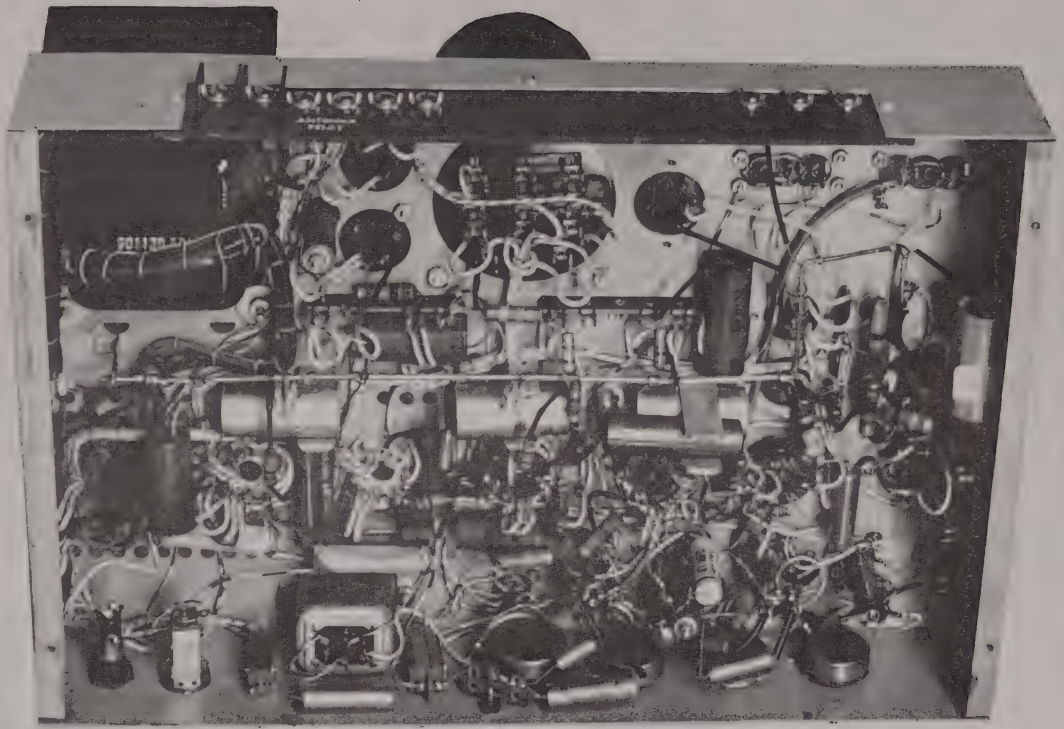
2. Audio Amplifiers, Phase Inverters, Power Amplifiers

The primary purpose of this block of circuits is to amplify audio signals from the phone patch as impressed on the primary of T-1, the input transformer; and provide ungrounded audio modulation voltages at an impedance level of 500 ohms to modulate the transmitter. This is accomplished with the following circuit functions:

(1) V-1 Triode Voltage amplifier
(2) V-2 Pentode Voltage amplifier
(3) V-3, V-4 Voltage amplifier-phase inverter stage
(4) V-5, V-6 Power amplifier-feedback controller
(5) T-2 Output Transformer

V-1 is a triode connected 6J7 which amplifies the voltages appearing across the secondary of T-1 and impresses its output across R-3, the Speech Gain Control. Normal cathode biasing is utilized in this stage.

TOP VIEW OF THE SPEECH CONSOLE



BOTTOM VIEW OF THE SPEECH CONSOLE

V-2 accepts as input whatever fraction of output is available at the moving arm of the Speech Gain Control and amplifies that signal through a normal pentode connected stage. Again, biasing of the stage is accomplished by cathode biasing. The output V-2 is fed to the grid of V-3 through compling condensers C-113 and C-4. The action of the limiter stage will be described later in the text.

The signal at the grid of V-3 is in effect, a signal with respect to ground. It is the function of V-3, V-4 to remove the ground reference and provide a phase inverted signal out of V-4 equal in amplitude to, but 180 degrees out of phase with the output of V-3. These signals will then drive the push-pull power amplifiers V-5 and V-6. Phase inversion is accomplished by taking a portion of the output of V-3 which appears across R-13 and applying that voltage to the grid of V-4. Since V-4 is an amplifier, the output is shifted 180 degrees with respect to the input, thus the voltage appearing across R-11 is shifted 180 degrees with respect to the output of V-3 which appears across R-10. The overall gain of V-3 is made equal to the overall gain of V-4 by the proper selection of the ratio of resistances of R-13 to R-12. Since the stage gains are identical between V-3 and V-4, the voltage impressed on the grids of V-5 and V-6 are identical, but out of phase by 180 degrees. Biasing is again accomplished by use of cathode resistors. Note that the cathode of V-3 is not by-passed. This is to permit the insertion of negative feed back voltage from T-2 to reduce the overall gain and thereby increase the frequency response of the amplifier and reduce second harmonic distortion signals.

The output stages V-5 and V-6 are normal, push-pull, cathode biased, beam power amplifiers. Frequency compensation is performed by networks consiting of C-11 and R-16, and C-12 and R-17. The plates and screens of these tubes utilize separate B+ supplies.

The output transformer T-2 is used to impedance match the tube output to a level of 500 ohms for transmission of the speech via cable #9 to the modulation section of the station transmitter. The second function is to provide a source of negative output voltage to feed back to the V-3 stage and thus provide a highly stabilized amplifier.

3. Audio Voltage Limiter; V-101

The function of the limiter is to provide the clipping of audio voltage excursions which would cause the over modulation of the trasmitter which in turn causes distortion of the output and the potentiality of modulator component failurs.

Limiting occurs whenever the instantaneious speech voltage coupled to V-3 exceeds either in the positive or negative direction one-half the direct voltage impressed on the dual diode V-101 by the Limiter Control R-122. When limiting occurs, the diode conducts and the signal is shunted to ground, thus clipping at that level. The limiter front panel control should be adjusted to provide limiting action to prevent the transmitter full load plate current from exceeding 400 miliamperes.

4. VOX Amplifier and Rectifier

The purpose of this circuitry is to provide a positive d.c. voltage which will compete with the negative anti-VOX bias, and when positive enough; cause the voice operated relay tube to conduct; which, is turn, will connect the antenna to the transmitter, and mute the receiver.

Voice signals (speech audio) are obtained at the V-3 grid. The VOX gain control provides a fraction of that signal to V102A, the VOX amplifier. V-102A amplifies the VOX SIGNAL and its output is rectified by V-103A. V-103A has a positive output, proportional to the audio voltage input resulting from speech energies into the microphone or telephone transmitter.

5. Anti-VOX Amplifier and Rectifier

The purpose of this circuitry is to provide a negative d.c. voltage proportional to the 75S2 receiver output. R-105, Anti-VOX Gain allows a portion of the receiver audio output to be impressed on the grid of V-102B, the Anti-VOX amplifier. V-102B amplifies this signal and the amplified signal is rectified by V-103B. The output is a negative d.c. voltage proportional to the receiver output.

6. Antenna Relay Amplifier and Relay

The outputs of the VOX and Anti-VOX rectifiers appearing across C-107 and C-109, are mixed, or added, in a proportion determined by R-113 and R-114 and impressed on the grid of the relay tube V-104A. With neither signal present, V-104A is normally cut-off and its plate relay deenergized because of the fixed cathode bias developed by the divider R-117 and R-118. However, whenever the resulting mixing of the rectified VOX and anti-VOX d.c. voltage provides a voltage which exceeds the fixed bias, the tube cuts on and the relay is energized. Thus, by adjusting the VOX and Anti-VOX Gain controls, one can balance the ratio of signals and established a reliable threshold of signals switch levels which will enable the system to automatically switch to the VOX position whenever the station

operator uses the microphone, or the telephone, and revert back to the receiver mode when he is not talking. To prevent drop-outs from occurring while the operator pauses in speaking and to reduce possibilities of self-oscillation, both the VOX and anti-VOX signals have long time constants of decay provided by the combinations of R-115 and C-107, and R-116 and G-109.

7. Sidetone Oscillator

When in the C-W position, it is necessary to generate an audio signal to cue the operator as to the quality of keying. V-104B and its associated circuitry provides a 1000 cycle tone to the audio stages of the 75S2 receiver through Jack J-3 of the receiver. Normally, the oscillator is biased off by the negative 50 volts appearing on the key lines and impressed on the grid of V-104B. However, when the key is closed (hand key instrument, or automatic keying devices) the bias is removed and the oscillator grid circuit is completed to ground, enabling the stage to oscillate. Energy is coupled from the oscillator through C-104 and reduced in magnitude by the ratio of R-103 to the J-3 impedance level. In the phone, or voice, mode the oscillator is prevented from functioning by removing plate voltage from the stage by the mode selector switch S-101.

8. Power Supply Components

220 volt alternating current voltage, controlled by Switch S-1, and protected by fuse F-1 is applied to the primary of the Power Transformer T-3. The transformer provides center-tapped 6.3 volts for filaments and high voltage for the full-wave rectifier V-7. R-18 serves as a surge resistor to prolong the tube life of V-7. C-13, C-14, C-110, C-101, C-15, C-16 and C-17 all function as by-pass condensers. R-19 and R-120 are primarily isolation resistors to prevent the voltage surges created by V-104 cutting on or off, and the possibility of 1000 cycle audio on the oscillator B+ leads from being fed to the sensitive, early stages in the amplifier section.

FUSE REPLACEMENT:

The fuse holder is located on the front of the speech console. Unscrew the fuse cap and the fuse will be readily accessible. Replace with a type 3AG 3 AMP fuse.

INPUT AND OUTPUT IMPEDANCES:

Note that the primary input has two balanced windings, the impedances of which are arranged as follows:

PRIMARY INPUT: 250 ohm, 30 ohm, center-tap, center-tap, 30 ohm, 250 ohm.

SECONDARY OUTPUT: Secondary output impedances are as follows: 0 -5-7.5-15-500 ohms.

For this contract the 30 ohm input and 500 ohms output taps are used.

GROUNDING

A terminal is provided on the output board which is connected directly to the amplifier chassis. A good connection to earth should be fastened to this terminal. If this precaution is not observed, hum may be coupled into the amplifier from the 230 volt mains.

CIRCUIT DESCRIPTION- OTHER COMPONENTS

Key: Any telegraph key may be utilized. Also, the use of any automatic keying device may be employed in parallel with the hand key. The only restrictions on the use of such devices is that the keying terminals be normally open (closed to energize transmitter) and that they operate on closure only (i.e. that no voltages are generated to cause keying. The use of devices that develop voltages will destroy the biasing arrangement of the side-tone oscillator.

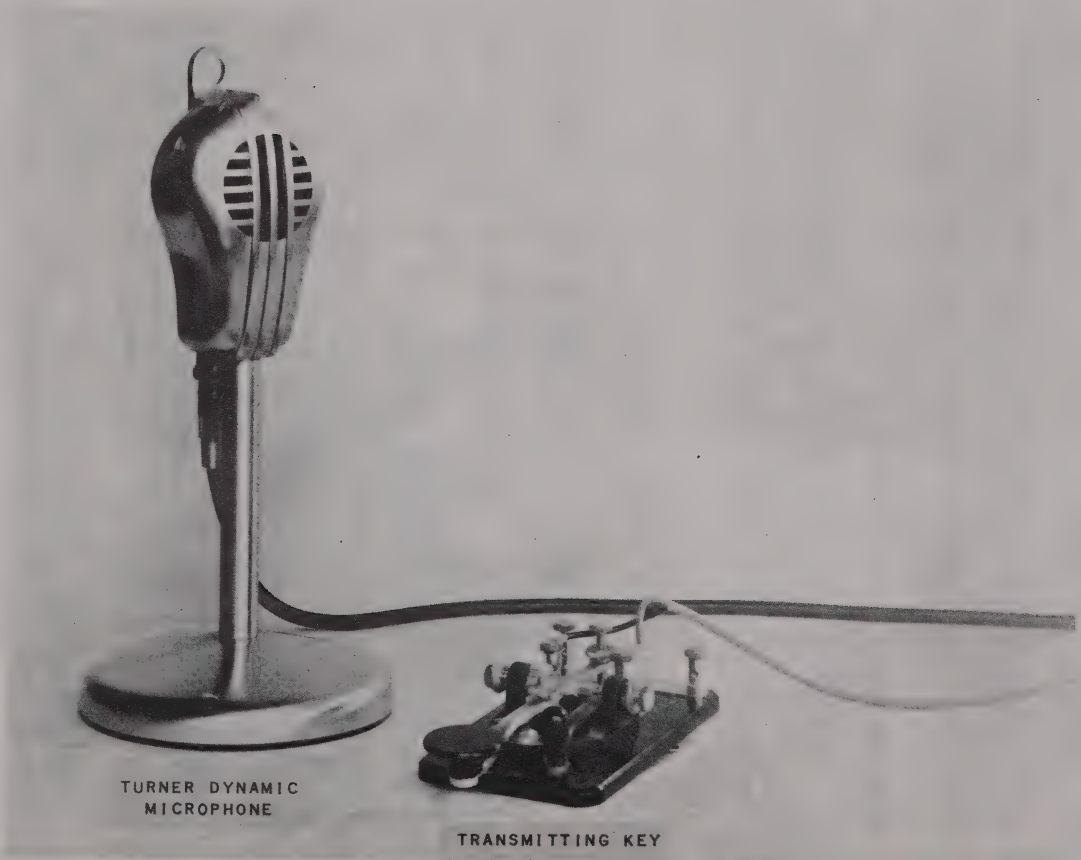
NOTE: If one side of the keying device is grounded, make certain that grounding is consistent within the keying circuit in order that the minus 50 volts used to cut off the keying tubes in the transmitter and the sidetone oscillator in the speech amplifier is unaffected.

Microphone: A low impedance, dynamic microphone is employed. If a different element is to be utilized, it will require analysis as to whether the input impedance level should be altered on T-1 the speech input transformer.

Antenna Relay: The antenna relay is a coaxial type, single pole double throw element with a set of conventional contacts for transmitter remote power control.

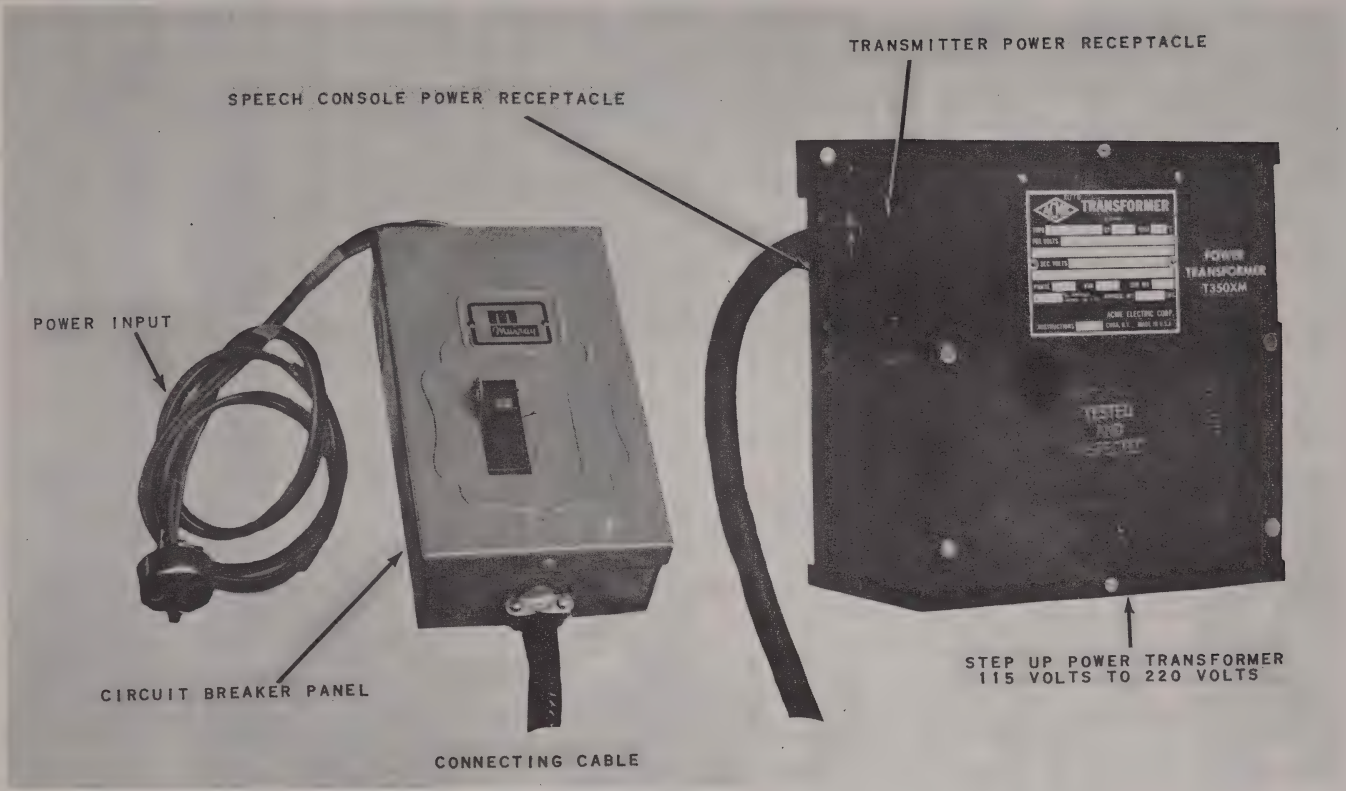
Energizing voltage of 6.3V AC is obtained when the VOX relay is energized. In the energized state, the antenna is connected to the transmitter. In the deenergized state, the antenna is switched to the 75S2 receiver.

When energized, a set of normally open control contacts is closed. These are used to as a remote power switch for the transmitter. Due to the slight delay on closing, the sequence



TURNER DYNAMIC
MICROPHONE

TRANSMITTING KEY


TRANSMITTER POWER RECEPTACLE
SPEECH CONSOLE POWER RECEPTACLE
POWER INPUT
TRANSFORMER
POWER TRANSFORMER T350XM
CIRCUIT BREAKER PANEL
CONNECTING CABLE
STEP UP POWER TRANSFORMER
115 VOLTS TO 220 VOLTS

allows the transmitter to be patched to the antenna before the high voltage is applied to the transmitter. Reverse sequence occurs on the deenergizing cycle.

Power Transformer and Circuit Breaker: The station is provided with an autotransformer to step up the locally available 110V, 50-60 cycle power to 220 volts to energize the transmitter and speech console. Also provided is a 115 volt AC outlet for the 75S2 receiver. Circuit protection is afforded by the main station circuit breaker located in a separate box which is intended to be readily accessible for off-on control and resetting.

Cables: All system cables are provided (excluding the antenna feed cable). The cabling block diagram will assist the planning for the installation and also indicate the maximum separation of system elements possible.

SYSTEM INSTALLATION:

General: This section of the manual is intended to guide the efforts of the individuals who must unpack, inspect, install and interconnect the major equipments of the Transmitter System.

The installation site must be provided with proper drainage and convenient to adequate power source and antenna locations. Assemble the following equipment for each installation. Caution, the transmitter is extremely heavy and contains ceramic and glass parts. Handle with care and do not drop.

(1) Transmitter (packed one per case, approx. 750 lbs.)
(2) Low Voltage Power supply (packed one per case, approx. 50 lbs.)
(3) Modulation Transformers (packed in multiple container)
(4) Speech Console (packed one per case, 35 lbs. each)
(5) Power Transformer (packed two per case, 50 lbs. each)
(6) Circuit Breaker Box (packed with breaker in carton 53 per export case)
(7) Set of Cables (packed in carton 53 cartons in two export cases)
(8) Operating Tubes, Transmitter (packed with Transmitter)
(9) Operating Tubes, Speech Console (installed in console)
(10) Microphone (packed in carton with cable #15)(one export case)
(11) Antenna Relay (packed with cables #6 and #10 and transmitter antenna adapter in carton)(53 sets per export case)
(12) Transmitting Key (packed in carton with cable #12) (53 per export case)

Setting Up Transmitter After Unpacking:

In some instances, it has been advisable to remove some of the heavier components from the equipment and pack them separately for shipping. For this contract the low voltage deck and modulation transformer have been packed separately to facilitate overseas shipment. In these cases, the following procedure should be followed:

1. Remove the side and rear cover plates of the transmitter. (screw driver required)
2. Remove the angle pieces, (painted red) along the outer sides of the filter chokes by unscrewing the holding bolts and snipping the metal retaining straps passing underneath the bottom of the transmitter. Further, remove any wood blocks or other packing material from the bottom high voltage power supply and filter.
3. Inspect interconnecting bus bar wiring in the bottom section to insure that none of the exposed wiring has been bent, broken, or shorted to chassis.
4. Remove low voltage power unit and modulation transformer from crate. The power supply unit has the master terminal board mounted integrally.
5. CAUTION!!!

   After the low voltage power supply is unpacked a careful inspection should be made on the tops of all transformers to insure that none of the terminals are touching grounded points on the cases. This same inspection should be given to the master terminal board. It is highly important that any shorts or loose connections be corrected before the low voltage supply is installed in the transmitter.

   SPARE NUTS:

   Spare nuts for the master terminal board will be found in a cloth bag attached either to the transmitter frame or to the low voltage supply.
6. Lift this unit into its proper position, i.e. with the short ends of the chassis resting on the two channels which are mounted above the high voltage supply.

The low voltage chassis should be pushed to the rear of the housing case until the edge nearly hits the two upright channels of the main housing case.

This deck fastens downward to the side channels by two bolts passing through holes in the chassis and slotted holes in the channels. Place these two bolts into position, put on lockwashers and nuts and simply make them finger tight.

The deck again fastens to the side channel by means of two welded brackets extending downward from the bottom of the low voltage chassis. It will be found that the holes in these brackets will line up with corresponding holes in the sides of the channels. Place bolts into position with nuts and lockwashers and tighten. After so doing return to the two top bolts and securely tighten the nuts.

7. It will now be necessary to connect the wiring harnesses, (leads from front panel—leads from rear connection strip—leads from interconnecting cables coming from buffer and final amplifier decks).
ALL WIRES ARE NUMBERED——connect any given numbered wire to the corresponding number on the master terminal board!! There are no exceptions. For example: Wire #1 will go to terminal #1; Wire #2 to terminal "2, etc.

It will be found that the connecting cables are formed so that the correct lug will assume approximately proper position in relation to the master board. Note further that there is considerable duplication of numbers. All such numbers however have common circuits. As example: There are three #14 on the master board. Any of the wires labeled #14 may be connected to any one of the three master board #14, or all three wires can be connected to a single #14 with identical results. Duplication of terminal numbers is done simply to avoid the necessity for putting several lugs on one terminal bolt.

866 Filament Connections:

Note carefully that the filament connections to the four 866's (mounted on the right hand channel——front panel reference) do not terminate on the master terminal board! They are connected directly to the filament transformer, T4 mounted on the low voltage power supply chassis. This transformer has the six filament connections on ceramic insulated terminals, numbered from #1 to #6. The six heavy wires connected to the 866 rectifiers are numbered in accordance with the numbers on the transformer and should be so connected. That is, wire #1 to filament transformer terminal #1, etc.

In placing these heavy wires on the ceramic insulated transformer terminals take great pains to see that none of the lugs on the wires short to each other or to chassis.

Deck Inter-connecting Cables:

Exactly the same precautions should be observed in putting the inter-deck connecting cables in place. Here again the general shape of the cable will generally aid in locating the proper wire number for a given deck terminal.

FRONT PANEL CERAMIC, FOUR SECTION SWITCH

Note that there are four wires coming from this switch. these wires likewise connect to the master terminal board. (Ceramic insulated terminals). Number-to-number technique is again applicable.

CAUTION

After all lugs are in position on the master board a careful inspection should be make to insure that no two lugs are shorting or that any lug is shorting to any terminal screw other than one with an identical number. If for any reason identifying numbers become illegible, reference should be made to the individual circuit diagrams.

9. Remove all packing and reinforcing material in buffer, final amplifier and antenna network decks.
10. Inspect all ceramic, mycalex or glass parts to determine possible breakage.
11. Loosen locks on all variable condensers and roller inductors and rotate dials to insure that all are in proper working condition.
12. Inspect all ferrule-type resistors (in clips) and remove tape or other fastenings used merely for purposes of shipment.
13. Mount the modulation transformer in position as shown in the photographs.

    The transformer should be mounted so that ceramic insulated terminals #3 and #7 are parallel with and nearest to the upright baffle shield.

    The plates of the two 805 modulators are connected to to terminals, #1 and #3. Terminal #2 is the modulator high voltage. Terminals #4 and #6 are connected to the two bus bars coming up from beneath the ferrule resistor R-19. See photograph of final amplifier for further details.

STATION INSTALLATION

Location. The transmitter should be located in a position that will permit ready access to the rear and both sides to facilitate crystal change and fuse replacement. It is further advisable to attempt to place the unit so that it will have reasonable air circulation.

INPUT POWER

The rear cover plate of the transmitter housing case should

be removed to expose the rear terminal board on which main power and remote control lines terminate. This terminal board is located on the rear, directly beneath the low voltage power supply.

The 230 volt AC line Cable #8 is capable of carrying at least 10 amperes with low voltage drop. (Transmitter maximum load is approximately 1,800 watts.) The cable used is make up of 3 conductors, #12 Gage.

There are openings in the bottom part of the housing case, directly under the two terminals marked 230 volt input. The input lines should be passed through the adjacent opening and the wire lugs firmly fastened to the power input terminal studs.

A white wire ground connection is also provided.

INTERLOCK SWITCHES

There are interlock switches on both sides and on the rear cover. The side and rear panels must then be tightly fastened into position before the transmitter will operate.

FUSES

There are two sets of fuses in the transmitter; one set for all filament circuits and the bias supply, and another set for high and low voltage power circuits. All fuses are replaceable by removing the left side cover. (Front panel reference.)

Fuses in the filament circuits are 3 amperes.
Fuses in the power circuits are 15 amperes.
Turn the circuit breaker to "off" prior to replacing fuses.

CRYSTALS

The five crystal sockets are located on the extreme left hand side of the oscillator-buffer deck and may be changed without removing the side cover by loosening the four screws holding the cover plate adjacent to the five crystal sockets. Crystal sockets take standard holders of the upright type having 3/4" pin spacing. The rear socket is position #1. The others go in corresponding sequence.

Crystals supplied are hermetically sealed, .005% tolerance, pressure mounted crystals having a series impedance of less than 120 ohms. The basic frequency is marked on the face. The operating frequency is marked on the top of the case.

TAPS ON TRANSFORMERS

All plate and filament transformers have primary taps to compensate for input line voltages varying somewhat from the 230 volt taps set up at the factory. Prior to initial operation, the line voltage should be measured with an accurate instrument to determine which of the three taps (210, 230, 250 volts) most closely approaches the actual line voltage. All taps on all filament and power transformers should be changed accordingly.

For this contract this will not be necessary since input voltage and adjustment is provided at the power transformer by changing the strap that connects the taps to the output connection.

WARNING

Erratic behavior of the final amplifier and/or antenna network on the higher frequency bands may be attributable to poor or improper bonding between decks. It is essential that the two rear holding bolts on buffer, final amplifier and antenna decks make definite electrical contact from chassis to transmitter frame. A lock washer must be used both on the head of the bolts and also under the nuts. This is important.

A braided cable has been provided so that it may be installed between the upper two decks to provide for proper bonding by soldering to each deck and tieing the end to the transmitter frame at the same point that the power source is grounded in the base.

SETTING UP THE SPEECH CONSOLE AND ASSOCIATED EQUIPMENT

The Speech Console is export packed in an individual case. This unit is complete with tubes and may be installed by locating the console in position on the operating desk. Inter-unit cables may be installed by removing the two rear covers on the console thus exposing the cable entry terminals and receptacles. The bottom rear cover may be removed by removing the two holding screws. The larger cover may be removed by removing the six thumb screws.

If it is necessary to remove the electronics chassis from the console cover this may be accomplished in the following steps:

1. Remove the Speech Gain, VOX, Anti-VOX and Limiting Increase knobs. This may be accomplished by loosening the two set screws.
2. Remove the knurled nuts from the two toggle switches.
3. Remove the Transmitter Light Assembly by pulling the glass forward and out.
4. Disconnect the phone patch cable at the console input terminals.

5. Remove the four rubber mounting feet screws on the bottom.
6. Slide the chassis to the rear and out.

Check to see that all the grid caps are firmly positioned.

Plug cables 3,4,5,9,12 into the appropriate positions on the chassis of the speech console. These cables should be routed to the center of the chassis and out through the bottom of the smaller cover.

Connect cables #9 and #10 to the screw terminals at the rear of the console.

Replace both rear covers after routing cables in a neat fashion. Cables #1,13,14 and 15 may now be connected to the Phone Patch unit which is located to the left of the console. Be sure the ground on cable #14 is terminated correctly because the 75S2 receiver uses a grounded audio system. The speaker should be mounted in a position to the front or away from the microphone for best Anti-VOX results.

The Hand Key and Microphone with desk stand should be located for convenience in the front of the Speech Console. The 75S2 receiver should be located to the left of the Speech Console on the table. A convenience outlet is provided at the power transformer for the receiver power input. This provides complete station control at the Circuit Breaker Panel. Circuit grounds are provided through the use of polarized power plugs.

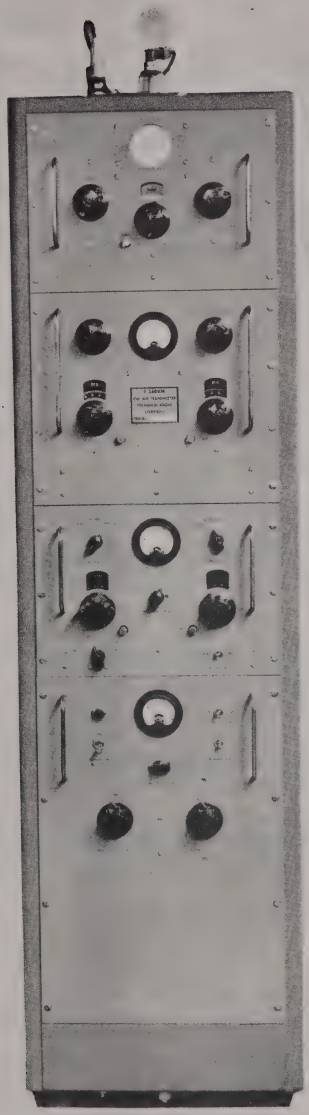
The antenna lead-in cable shall be routed to the antenna position of the antenna change over relay. This may be made using RG-11A/U coaxial cable or equivalent. The Antenna-Change-Over relay is fitted to accept a PL-259 Coaxial connector.

SETTING UP THE POWER TRANSFORMER AND THE CIRCUIT BREAKER PANEL

Both units are designed for wall mount and may be installed by using the screws provided in the small bag. The Circuit Breaker panel should be mounted in a convenient location for Station on-off control. The Power Transformer may be located on or near the floor at a point where it provides the best cable routing for servicing the Speech Console and the Transmitter. A seven foot cable has been provided between the Circuit Breaker Panel and the Power Transformer. Local power should be provided to the input of the Circuit Breaker Panel. The black lead is the hot connection with the red (or green lead) the return. A white lead is provided for system ground. For a two wire grounded supply the neutral

ANTENNA CHANGE OVER
RELAY

DUMMY LOAD



T-350 XM TRANSMITTER

and ground may be connected together. For a two wire ungrounded supply connect the hot and neutral leads to the power source and connect the white lead to ground.

CABLES:

The cables listed in Table I are supplied for interconnection between units. Each cable is identified by a number (see column 1) located near the end of the cable termination shown as location 1 in the second column. The block diagram shows the inter unit cabling. Length has been based on centrally locating the speech console on a table with the transmitter on the right and the 75S2 receiver on the left. Cables may be grouped and routed from the rear of all units.

Antenna Relay:

Remove the antenna relay and adapter post from the unit packing. The remote power leads to the transmitter cable #6 are connected to the relay leaf contacts. The cable to the Antenna connection of the Speech Console cable #10 is connected to the coil assembly.

Mount the adapter and relay as shown in the photograph. It will be necessary to remove the existing coax receptacle. Attach the remote power leads (cable #6) to the terminals indicated as "Remote Switch" at the base in the rear of the transmitter.

Connect the short lead provided with the Antenna Relay Unit Pack from the RF Ammeter post to the coax output receptacle. This parallels the existing lead that runs to the open wire glass terminal at the top of the transmitter. With this arrangement the RF output is available to the antenna via the antenna relay for normal transmitting operation. For test work a dummy load can be easily attached to the glass terminal post for service and maintenace checks. Note: This load may consist of three one hundred watt light bulbs connected in series.

Audio (Speech) Input

Attach the transmitter end of cable #9 to the terminals marked 500 OHMS LINE and make the connection to ground as shown on the block diagram.

Key Cable

Attach the transmitter end of cable #7 to the terminals indicated in the block diagram. Check to see that all grounds are properly made. These include power, manual key, key shield and the audio shield.

DRAFT SPECIFICATIONS FOR FAIRFIELD RF SYSTEMS

Power line	:	480 V 3 phase.
Frequency	:	13.56 MHz, crystal controlled.
Outputs	:	Total of 12 outputs. six in phase, six 180 deg. out of phase.
		Type N connectors.
		Output impedance 50 ohms (nom)
		Each output capable of at least 500 W continuous and at least 900 W for 5 sec.
		Able to feed 500 W to infinite SWR for at least 5 sec.
		Able to withstand crosstalk (backfeed) of 100 W.
Control	:	Neg. feedback of 0-10 V DC. Reference level set by local pot or by ext. 0-10 V source. Indiv. outputs have separate trim adjustments from 0 to full master control reference setting.
		Regulator stability better than 5%.
		Each output has switch so it may be shut off without affecting others.
		Standby - RF ON controlled by either local or remote TTL control.
		Gooser circuit built in to raise power to 700 - 900 W (adjustable) for about 0.1 sec at 1 sec after RF keyed on.
		Individual overload protection so if one amplifier shorts or overloads, others will stay on.
Metering	:	
		Fwd and reflected pwr of each output. (also avail. as DC analog signals) Bird or comparable directional couplers.
		Plate [collector] current for each amplifier (also avail. as DC analog signal)

Alarm if any output sees more than preset reflected power (adj. 10-50 W). Alarm closes N.O. relay contacts.

Alarm if cooling fails or amplifier overheats. Alarm closes N.O. relay contacts.

Construction : Standard 19" rack cabinets

Color PMS grey 430 and/or PMS blue 3155

If final amplifiers air cooled, use positive pressure blowers.

Air filters on cabinet vents.

Power amplifiers modular, easily changed for service.

General attention to serviceability and modular construction.

Safety : Interlocks on rack cabinet doors.

Conform to National Electrical Code and NFPA 79.

Reliability : MTBF at least 5000 hrs. for system with prescribed maintenance.

Driver stages limited or otherwise protected from overload in case output cannot satisfy control loop.

RFI : System must incorporate good engineering practice with regard to shielding, RFI suppression, and control of harmonics and spurious emissions. It should conform to applicable FCC Regulations, specifically Part 18, subpart C.

Spares : 4 spare power amplifiers.

4 spare drivers

2 spares of all other modules including control circuits

1 spare power supply unit.

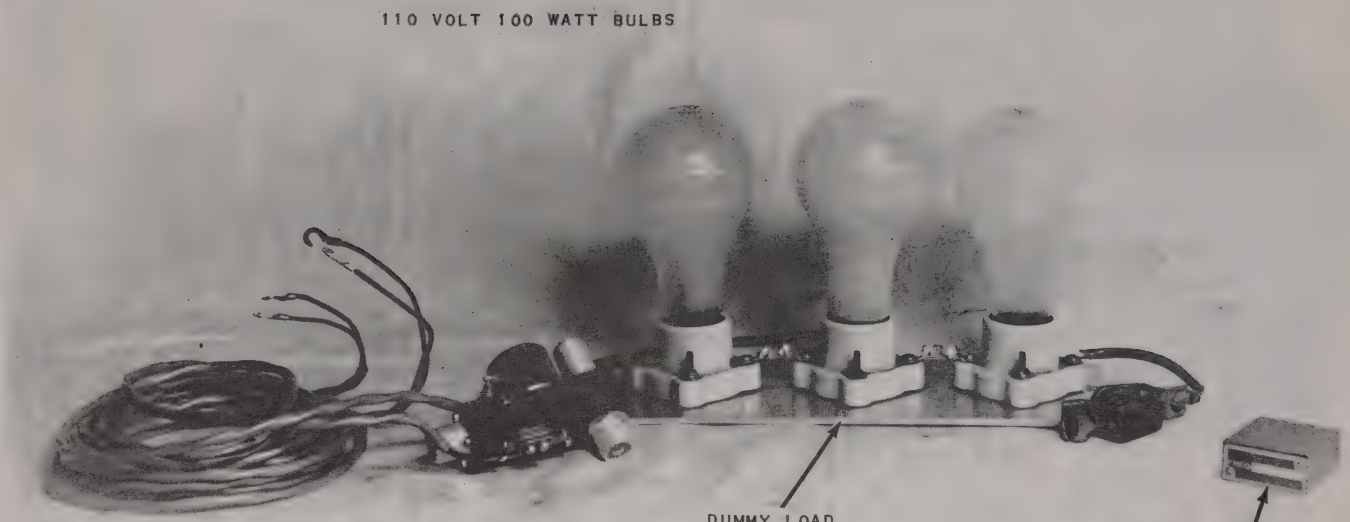
Three

Design Review :

APS will review general design and layout before beginning of construction.

Additional Suggestions :

1 power supply per 6 outputs, housed in separate cabinet with connectors in interconnecting cable to permit exchange.



ANTENNA CHANGE OVER RELAY
AND CABLES

PANEL CONTROL FUNCTIONS:

Power Supply Panel:

Filament Switch: This switch SW-13 in the diagram is a DPST type and closes both sides of the 230 volt line, thereby energizing all filament transformers as well as the bias supply. This switch should be energized 30 seconds before applying power to the speech console.

Power Switch: This switch SW-19 in the diagram is a SPST toggle type and completes the power relay holding coil circuit when in the "ON" position. This relay in turn energizes power transformers in both the high and low voltage supplies. The terminals of this switch are paralleled by the two terminals on the rear board marked "REMOTE SW" thus permitting remote operation on either phone or CW. For this contract, control is provided at the speech console. Therefore, this switch should be "OFF" for speech console operation.

Transmitter Test Switch: This switch, SW-26 in the diagram is a DPDT toggle type and closes both keying circuits to ground when in the "ON" position. Leave this switch "OFF" since local control is at the speech console.

High-Low Power Switch: This switch, SW-5 in the circuit diagram, is a two pole, single throw, single section ceramic type and has the function of reducing the transmitter power for test and adjustment purposes. It functions as follows when set on "LOW":

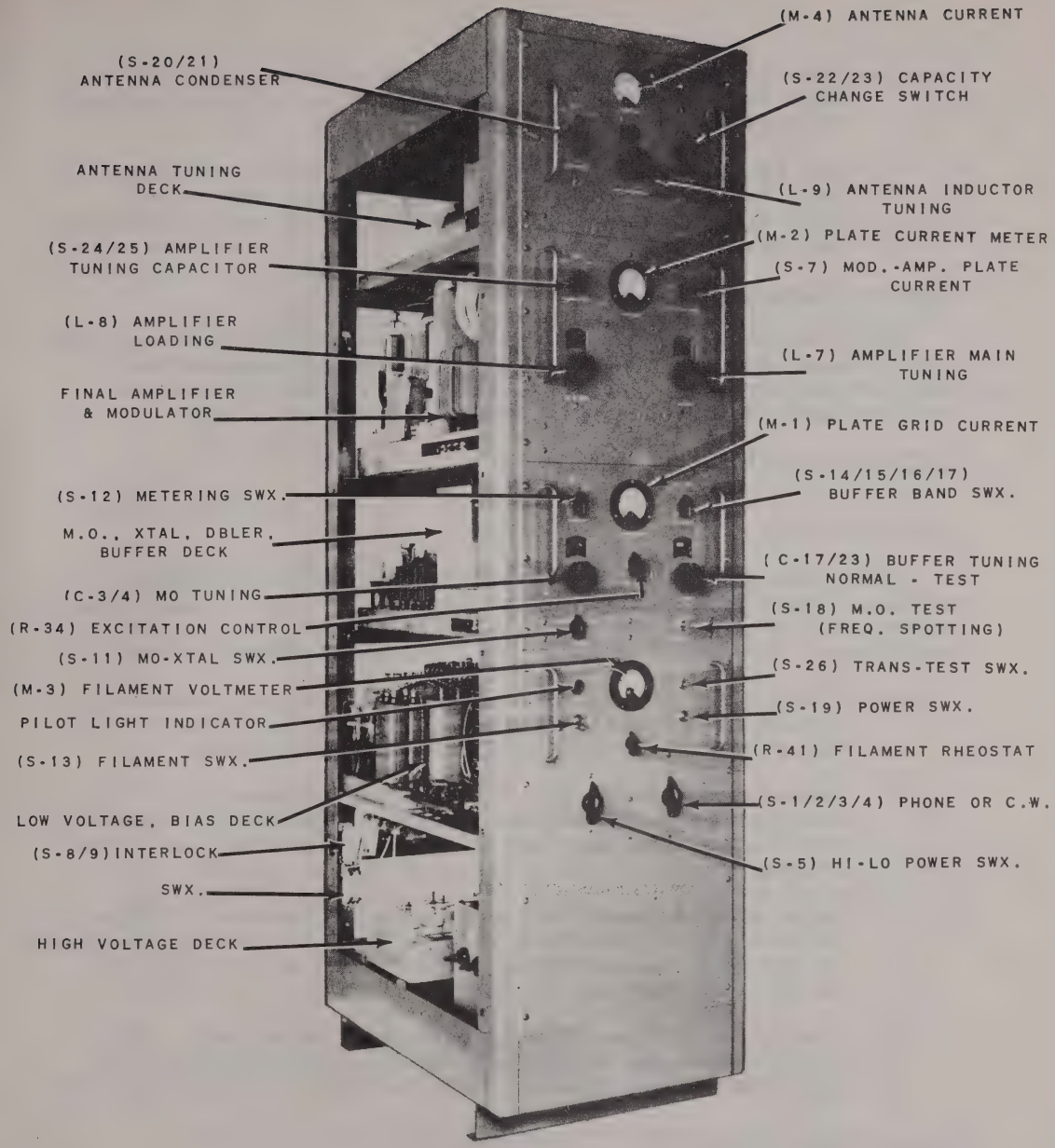
a. One section of the switch removes a short across the cone resistor R26 placing this resistor in series with the high voltage transformer thereby reducing the secondary voltage.
b. The other switch section removes the short across an additional resistor R-28 thereby introducing an additional resistor in series with the screen of the final amplifier. This precaution insures that the 813 screens will be protected with the PHONE-CW switch in either position.

Phone-CW Switch

This switch, SW1-2-3-4 in the circuit diagram is a four pole, two position, four section ceramic switch and functions as follows:

The following description assumes the switch to be switching to the CW position from PHONE:

a. The first two switch sections change the two high voltage rectifiers, (final amplifier) to the highest voltage taps on the main transformer.



Front view—T-350XM Transmitter (side and rear covers removed).

b. The third switch section disconnects the modulator high voltage and shorts the center tap of the modulation transformer primary to ground.

c. The fourth switch section serves to switch the final amplifier screens from the high voltage modulated source, (through dropping resistors) to the low voltage supply.

Filament Rheostat:

This resistor R41 in the diagram is connected in series with the filament transformer primaries and aids in maintaining filament voltages at proper levels. The filament voltmeter on the panel should always be set to 10 volts.

Buffer-Oscillator Panel Controls:

MO-XTL SWITCH:

The SW11 in the diagram is a five pole, five position ceramic rotary switch having four decks. Basically this switch selects either the master oscillator or any one of five crystal positions. Functions of individual switch sections follow:

a. First ceramic section (nearest front panel) connects either the master oscillator or crystal oscillator to the grid circuit of the first buffer-doubler.

b. Second ceramic section (front panel reference). This section opens the screen circuit of the 6SJ7 master oscillator tube when any of the five crystal positions are used.

c. Third ceramic section (front panel reference). This section shifts the high voltage from the master oscillator to the crystal oscillator, (6J5) when set on any one of the five crystal positions.

d. Fourth ceramic section (front panel reference). This section selects any one of the five crystal positions when the switch is set to the equivalent panel markings.

NORMAL-TEST SWITCH:

This switch SW18 in the diagram is DP-DT toggle and permits the master oscillator to function independently of the rest of the transmitter.

When the switch is on "TEST" position, the screen circuit of the first buffer-doubler is opened and the master oscillator screen circuit is closed. The master oscillator is then

operative regardless of whether or not the keying circuits are closed.

EXCITATION CONTROL:

This is a variable resistor (R34 in the diagram) permitting adjustment of the grid current of the final amplifier. It functions as follows:

a. This resistor forms part of voltage divider, (R33, R34 R43) connected across the low voltage supply. The screen of the first buffer-doubler is connected to the center arm of this resistor and in this manner excitation can be controlled by changing the screen potential of the buffer.

METERING SWITCH:

This switch marked SW12 in the diagram, is a two pole, three position ceramic rotary type and shifts the 0-100 ma., meter to:

1. 1st Buffer Plate

2. 2nd Buffer Plate

3. Final amplifier grid

BUFFER RANGE SWITCH

This switch marked SW 14-15-16-17 in the diagram consists of four ceramic sections of the two pole, four position type, ganged together on a common flat shaft. The functions of these switch decks follows:

Looking at switch from rear of deck——

a. Section nearest to trimmers——S14
Right hand section—connects trimmer condensers C24 and C25 to L4 on positions #3 and #4 respectively.

Left hand section——switches L3 into first buffer plate circuit on switch position #1 and switches L4 into first buffer plate circuit on positions #2, #3 and #4.

b. Second switch section (same reference) S15
Right hand section——connects first buffer plate to second buffer grid on position #3 and #4.

Left hand section——shorts L3 on positions #2,#3 and #4.

c. Third switch section (same reference) S16
Right hand section——applies screen voltage to second buffer on positions #3 and #4.

Left hand section——connects final grid coupling condenser to tap on L3 on switch position #1. To tap on L4 on position #2 and to plate tank of second buffer in positions #3 and #4.

d. Fourth switch section (nearest front panel) S17
Right hand section——connects L5 into second buffer plate circuit on position #3. Connects L6 into second buffer plate circuit on position #4.

Left hand side——shorts L5 on position #4.

FINAL AMPLIFIER DECK: (Second from top)

AMPLIFIER MAIN TUNING:

This dial causes the final amplifier main tuning inductor to rotate thereby varying its inductance by means of a sliding, shorting roller.

AMPLIFIER ANTENNA LOADING:

This dial rotates a smaller inductance in series with the main tuning inductor. The antenna tap is connected to the junction of these two coils therefore adjusting the turns ratio of the two coils will, in effect, give the same effect as tapping the antenna network up and down on a single inductance. By this method greater or lesser coupling to the antenna network is possible.

AMPLIFIER TUNING CAPACITOR:

This switch marked SW24-25 in the diagram, is a two section, ceramic high voltage rotary type. Operation is as follows:

a. High C——In this position, both of the two fixed air condensers are shunted across the final inductances. This provides lowest frequency operation.

b. Medium C——In this position, the smaller of the two air condensers is switched across the two roller inductors.

c. Capacity Out——In this position, both of the capacitors are disconnected from the circuits.

MODULATOR——AMPLIFIER PLATE CURRENT:

This switch, marked SW7 in the diagram is a single section, two pole, two position ceramic section. This switch places the two meter terminals across either one of the two resistors, R36 and R37, connected respectively into the final amplifier and modulator filament center tap circuits.

ANTENNA NETWORK DECK (Top of Rack)

ANTENNA INDUCTOR TUNING:

This dial rotates a roller inductor used in the antenna network circuit.

ANTENNA CONDENSER:

This switch marked SW20-21 in the diagram is a two section ceramic, double pole, three position type. It serves to:

a. Place the condenser (selected by the CAPACITY CHANGE SWITCH) in series with the antenna inductor.

b. To place the condenser as selected in shunt with the antenna inductor so as to form a pi network.

c. To remove the condensers entirely from the antenna circuit leaving merely the inductor in the circuit.

CAPACITY CHANGE SWITCH:

This switch, Marked SW22-23 in the diagram is a two section ceramic, double pole, nine position type. Its function is to select any one of the six different fixed air condensers, individually or in combination. The connections are such that the capacities <u>increase</u> as the switch is rotated in a <u>clockwise</u> direction.

ANTENNA AMMETER:

This meter is a 0-8 ampere RF type and is connected in series with the antenna at all times thus serving to give an indication of proper performance of the transmitter. Typical values for proper operation range from 4-6 amps.

TRANSMITTER TUNING:

TUNING DIAL DETAILS:

A special type of interpolating counter dial is used on all tuning condensers and inductors in the T-350XM transmitter. A brief explanation of this dial follows: The dial has a conventional type counter (0-99) visible through an opening in the panel. Directly below this counter is a rotating disc having 200 divisions. The numbering on this scale reads from 0 to 100 giving 100 significant figures. Each of these figures is in turn broken into two parts. The scale can be read as 10½—11½, etc. It can be seen that a new number appears on the counters with each complete revolution of the shaft (360 degrees). The interpolating scale further divides one complete revolution into 200 parts. With this dial it becomes possible to accurately log any given number of revolutions as well as to maintain an accurate record of the position of the revolving element, (coil or condenser) at any particular dial setting. In reading the dial, a typical setting might be 20-52. The first figure (20) being taken from the counter, the second figure, (52) from the interpolating scale as read at the intersection of the red hair line with the calibrated figures on the disc. The above explanation should be carefully studied in conjunction with actual manipulation of one of the dials.

MASTER OSCILLATOR SET UP DETAILS:

Each master oscillator is provided either with an individually calibrated tuning curve or chart. In either case set-up procedure will be the same.

To operate on any given frequency within the 2,000 to 20,000 kc., range it will first be necessary to establish the correct oscillator frequency. This frequency may be pre-determined as follows:

Band #1—2,000 to 4,000 kc.
Oscillator frequency identical with output frequency.

Band #2—4,000 to 8,000 kc.
Oscillator frequency <u>one-half</u> of output frequency.

Band #3—8,000 to 16,000 kc.
Oscillator frequency <u>one-fourth</u> of output frequency.

Band #4—16,000 to 20,000 kc.
Oscillator frequency one-sixth of output frequency.

For multiplying factors for buffer-doubler stages see CIRCUIT DESCRIPTION and consult block diagram.

NOTE: The above stipulations on master oscillator frequency for a given output frequency apply also to all crystal frequencies. That is, all crystals, regardless of the output frequency, will lie within the 2,000 to 4,000 kc. range.

It will be noted that the master oscillator merely covers a two-to-one frequency range, i.e., 2,000 to 4,000 kc.

EXAMPLE 1:

Output frequency is 20,000 kc. Master oscillator frequency will be one-sixth or 3,333,333 kc., because 20,000 kc., lies within band #4.

EXAMPLE 2:

Output frequency is 16,000 kc. Master oscillator frequency will be one-fourth or 4,000 provided band #3 is used. (8,000 to 16,000 kc.). Since 16,000 kc. can be covered on either band #3 or band #4, an additional combination is possible. using band #4, oscillator frequency would be one-sixth of 2,666.66 kc. Good judgment would dictate that the even figure of 4,000 kc., for oscillator frequency be used. (Hence using band #3 for the 16,000 kc., frequency.)

The calibration curve may be used for approximate pre-setting of the M.O. A frequency standard or known signal source should be used when it is necessary to set to an exact frequency.

TEST-NORMAL SWITCH: (For Frequency Spotting)

When comparing the master oscillator against a known frequency source or gainst another station, the TEST-NORMAL SWITCH can be used. Putting this switch on the TEST position makes it possible to run the master oscillator alone without the rest of the transmitter.

TRANSMITTER TUNE-UP PROCEDURE:

CAUTION!!!

All preliminary tests or tune-up should be made with the HIGH-LOW power switch on LOW!!! Failure to observe this caution may result in failure to some of the tubes!

Preliminary Steps

1. Set HIGH-LOW power switch to LOW.

2. Turn FILAMENT SWITCH to ON. Pilot lamp should light. Permit 866 rectifier filaments to warm up for at least one minute before applying high voltage!

3. Adjust FILAMENT RHEOSTAT until filament voltmeter reads 10 volts. (If you cannot get 10 volts change power transformer strap to the higher position.)

4. Set master oscillator switch to MO position.

5. Set NORMAL-TEST switch to NORMAL.

6. Set master oscillator dial to correspond to proper frequency. (Alternately, set MO-XTL switch to proper crystal channel).

7. Set BUFFER RANGE SWITCH to proper band as determined by previous description.

8. Set up BUFFFER TUNING variable condenser to approximate frequency.

NOTE: The buffer dial scale differs from the other dials in that it merely rotates one-half revolution in 180 degrees. The dial scale reads from 0 to 50 and has one hundred parts over this range. Note that low dial reading gives highest frequency. This is exactly opposite to all the counter dials.

As an aid to an approximate pre-setting——if the desired frequency is near the low end of a particular band, the buffer dial should be set toward the highest dial reading. If near the center, set the dial near 25 on the dial scale. If near the high end, set dial near the zero end of the scale.

It is important that the buffer dial be set correctly in the initial set up since the buffer stage covers a two-to-one frequency ratio. Under these circumstances, it is possible to obtain two buffer plate current indications if the operating frequency is close to the low frequency end of a particular band. As a check, always select the buffer indication at the lowest frequency, (highest dial reading), if two indications are obtained.

9. Set METERING SWITCH (buffer panel) to 1st BUF.P if either band #1 or #2 are to be used. Set to 2nd BUF.P if either band #3 or #4 are to be used. (Note that the second buffer is not used on band #1 or #2).

10. AMPLIFIER TUNING CAPACITOR:

The switch on the amplifier tuning capacitor should be set as follows:

Band #1——Set to HIGH"C"

Band #2---Set to MEDIUM "C"

Band #3---set to LOW "C"

Band #4---set to LOW "C"

11. Set AMP-MOD. PLATE CURRENT SWITCH TO "AMP.P"

12. Set phone CW switch to CW for all test set-ups.

WARNING

DO NOT SHIFT ANY OF THE RANGE OR CAPACITY SELECTOR SWITCHES WITH THE POWER ON.

TUNING PROCEDURE:

The following assumes that all controls have been set up as previously described in accordance with the frequency to be used. Leave the speech console off & test from transmitter position only. For this test connect dummy light bulb load to observe performance.

1. Put POWER SWITCH to "ON".
2. Put TRANS. TEST SW to "ON".
3. For 1st buffer, tune buffer dial to dip since this stage has fixed bias. (NOTE: For more than one dip use largest dial reading)
4. For 2nd buffer rotate buffer tuning dial until a MAXIMUM indication is obtained on the buffer plate current meter. This stage is biased to cut-off and maximum excitation to the next stage occurs with maximum buffer plate current.
5. Having observed the above, change the metering switch over to AMP. GRID and adjust the EXCITATION CONTROL until the amplifier grid current is approximately 10 milliamperes. Note that the grid current may tend to increase when the final amplifier is resonated. The metering switch should be left in the grid current position so that the grid current can be reset.
6. Assuming that the final amplifier tuning capacitor has been set as previously described, proceed to resonate the final amplifier. This will be accomplished by rotating the knob on the counter dial marked, AMPLIFIER MAIN TUNING. Note that the highest dial reading gives the lowest inductance. Adjust this control until the amplifier plate current takes a definite dip, or minimum.
7. The exact settings for the antenna network will depend to a great extent upon the type of antenna used. In

general, the following will apply:

a. When using short antenna, (against ground) where the base impedance may range from two to forty ohms, a series network is best. For this connection, the antenna condenser should be put in the series position. This puts the antenna variable inductor in series with the antenna condenser.
b. When certain random length antenna are used, it may be desirable to cut the series capacity entirely out of the circuit. This may be accomplished by putting the antenna condenser to "OFF".
c. For higher impedance antennas and certain transmission lines the PARALLEL connection can be used to advantage. Putting the switch on "PARALLEL" changes the antenna circuit into a pi network.

8. For purposes of illustration it will be assumed that the series ANTENNA connection is to be used.

a. In the series connection always attempt to arrive at a resonant combination where the least possible inductance, (antenna loading coil) is used. This will mean that the antenna series capacity will be large.
b. An initial combination must be found that will load the final amplifier, i.e. cause the amplifier plate current to increase, (from the dip point) simultaneously with a showing on the antenna ammeter. After this point has been found, it will be desirable to work toward maximum output by increasing the coupling to the final amplifier.
c. Coupling may normally be increased by changing the ratio between the antenna coil titled "AMPLIFIER MAIN TUNING" L7 and the coil titled "AMPLIFIER LOADING" L8.

In general, the greater the number of turns in the small coil L-8 the greater the loading. Since the two coils are in series, increasing the number of turns in one coil will mean that turns must be decreased in the other coil in order to maintain amplifier resonance. It is further entirely possible to overload the amplifier by increasing coupling beyond the optimum point. With the transmitter on low power the maximum plate current load will not exceed 150 milliamperes. Normally only a few turns are used in L8. This corresponds to a low dial reading.
d. With certain types of antennas on some frequencies

it may be found that the smaller coil "AMPLIFIER LOADING" L-8 will have small effect on the loading. In such cases, adjust with the antenna loading inductor and/or capacitors, in conjunction with the normal plate current dip procedure obtained with the final amplifier main tuning inductor.

e. When the antenna circuit has been properly adjusted, put the transmitter on high power long enough to observe plate and grid currents.

THE FULL-LOAD PLATE CURRENT SHOULD NOT EXCEED 400 MILLIAMPERES! See the adjustment of the "limiter increase" knob on the speech console to limit current.

THE FULL-LOAD GRID CURRENT SHOULD BE SET AND MAINTAINED AT FROM EIGHT TO FIFTEEN MILLIAMPERES BY THE EXCITATION CONTROL.

Should the plate current exceed this value, the transmitter power switch should be turned off and the transmitter again put on low power.

Reduce the coupling by changing the ratio between the two amplifier coils, (decreasing turns in the smaller coil) and setting the plate milliammeter for minimum plate control.

The transmitter should again be switched to high power and the loading checked. Carefully rotate the amplifier main tuning inductor to make certain that the stage is set for minimum plate current.

ADJUSTMENT OF PARALLEL CONNECTION (PI NETWORK):

Certain generalizations may be made that will prove helpful in setting up the pi network.

1. In general, the lower the frequency, the greater capacitance will be the antenna capacitor.
2. In making initial adjustments, start out with a small amount of turns in coil L-8, "AMPLIFIER LOADING" (Low Dial Reading). In other words, use loose coupling. This corresponds to a low dial reading.
3. With the ratio so set, adjust the final amplifier main inductor for minimum plate current.
4. The antenna condenser will basically establish the load, hence it will be necessary to take a step-by-step procedure, changing to a given capacity by switching the "CAPACITY CHANGE SWITCH" and then rotating the coil "ANTENNA INDUCTOR TUNING" L-9 through its range, meanwhile watching for an increase in amplifier plate current coincidental with a reading on the antenna ammeter.

5. Once this point has been located, various combinations of antenna inductance and capacity should be tried in an attempt to get maximum antenna current. In order to determine if the final amplifier loading is insufficient after a definite maximum setting has been achieved, try to increase the loading.
6. A few more turns should be added on the loading inductor L-8 (Greater Dial Reading) and resonance again established by the amplifier main tuning inductor. (Indicated by minimum plate current). Loading can be increased up with an increase in plate current. The maximum full load plate current of 400 milliamperes should not be exceeded.
7. It is possible to obtain a combination of antenna network settings wherein the final amplifier will draw heavy plate currents with little or no indication of antenna current. Such a setting should be avoided.

NOTE:

A set of dial readings should be provided to the operator so that he may change frequencies easily by simple setting of the dials. Further, a set of minimum and maximum readings should be made available for proper interpretation of the operating conditions of the transmitter system.

NON-TECHNICAL OPERATION:

General

The following description assumes that the transmitter has been properly tuned and is ready for operation.

1. Turn on FILAMENT SWITCH and wait for at least one minute before applying power. This interval is to permit tubes to come to operating temperature.

While waiting for the filaments to heat, check the following positions:

NORMAL-TEST switch on "NORMAL".
TRANS. TEST switch to "OFF".
HIGH-LOW power switch on "HIGH".
FILAMENT RHEOSTAT adjusted so as to give a 10 volt reading.
PHONE - CW switch set for the particular type of operation desire

2. Put POWER switch to "OFF". Normally, the transmitter will be operated from the speech console. In this case, the power switch on the panel will be left on the "OFF" position and the circuit closed by the antenna relay contacts. NOTE: For phone operation either close the key switch or set the trans-test switch to "ON".

Break-in keying circuits are used hence there will be no signal in the receiver from either the crystal or master oscillator when the key is up.

Never attempt operation unless the FILAMENT SWITCH HAS been turned on for at least one minute prior to application of power.

OPERATION OF SPEECH AMPLIFIER: NON-TECHNICAL

The following description assumes that the speech amplifier has been properly installed and connected to the transmitter:

1. The power switch should be turned to "ON" and the tubes permitted to come to operating temperature.
2. With all controls of the transmitter set for radiotelephone, (voice) operation, the MOD-AMP. PLATE CURRENT switch, (on the transmitter) should be set to "MOD.P" and the carrier put on the air.
3. Speaking into the microphone in a normal, conversational tone of voice, adjust the AUDIO GAIN control on the speech amplifier until the current on the transmitter meter kicks on peaks to approximately 400 milliamperes. This will normally represent full modulation. There is no set rule for adjustment of the audio gain control since settings will vary with individual voices. The modulator plate current should be observed by each operator and the gain control set for peak reading. (400 milliamperes.)

   If a large variation of speech input is expected, increase the setting of the "LIMITING INCREASE" control thus providing limiting operation to 400 mils on peak signals. Normal settings of the vox and anti-vox controls are approximately 80% full setting. Adjust the anti-vox to keep the station speaker from keying the transmitter. Adjust the vox control so that the transmit light goes on when the microphone is used.

TECHNICAL NOTES

TRACKING DOUBLER STAGES——BAND #3 and #4.

BAND #3——

(1) Set Buffer range switch to BAND #3.
(2) Set Oscillator frequency 4000 KC.
(3) Set Meter range switch to 2nd Doub. P.

(4) Apply power and tune buffer tuning condenser for a MAXIMUM rise of plate current. Note that care must be taken to insure that this indication is obtained with the buffer tuning condenser toward MINIMUM capacity. (A second point will be noted toward the MAXIMUM capacity setting.)
(5) Reset meter switch to AMP.G and carefully tune for maximum grid current. In preliminary adjustments, the excitation control may be well advanced, (clockwise) in order to get some indication on the meter.
(6) The trimmer condenser on Band #3, (located on the rear variable condenser switch bracket——left-hand side, front panel reference), must now be adjusted. Using an insulated screw driver, carefully rotate this trimmer, meanwhile rocking the main tuning condenser so as to give a maximum grid current reading. An optimum point will be found where the grid current will be at a maximum, the plate current of the second doubler being at a minimum.

NOTE:

The excitation control should be retarded as the resonance point is approached so as to keep the grid current inside of the 15 milliampere maximum.

(7) The oscillator should now be switched to 2000 KC., and the buffer tuning condenser rotated so as to give a grid current deflection with the tuning condenser near maximum capacity. It will be found that the grid current will be slightly lower at this end but still well within limits.

TRACKING DOUBLER STAGES——BAND #4.

The tracking procedure for Band #4 is identical with that outlined for Band #3 with the following exceptions:

(1) Use right-hand trimmer on rear variable condenser upper switch bracket.
(2) Adjust trimmer and variable condenser with oscillator frequency set to 3333.33 KC. and make certain that the tuning condenser gives a kick on the second buffer plate current meter with the condenser set toward minimum capacity.
(3) Adjust for maximum amplifier grid current. However, make certain that the final adjustment is such that a grid current of about 10 milliamperes can be obtained with a second doubler plate current not exceeding 70 milliamperes.

CAUTION:

The excitation control should never be so far advanced on Band #3 or #4 that the second buffer plate current exceeds 70 milliamperes as read on the meter. The meter actually reads plate, screen and grid current but this has been taken into account in the 70 milliampere figure. If this caution is ignored, the plate currents on the second doubler may be such as to exceed the rated plate dissipation of the tube and hence ultimately result in tube failure.

NOTE:

It should be noted that the second doubler stage is supplied with full cut-off bias hence there will be no plate current when there is no excitation. Further, that this stage will be tuned for maximum plate current at resonance. The first buffer-doubler has some fixed bias supplied by the voltage drop across the keying tube. However, plate current flows at all times hence resonance will be indicated by the normal, plate current "dip".

MASTER OSCILLATOR ADJUSTMENT:

Note that the trimmer on the grid variable condenser controls the frequency. The top of the first shield box, (nearest front panel) must be removed to expose this trimmer. It is strongly suggested that this trimmer be left alone until such time as it is definitely established that the oscillator is out of calibration. Adjustment is as follows:

(1) An accurately known frequency source set to 4000 KC., should be beat into a receiver tuned to this frequency.
(2) The dial on the master oscillator should be set to 17-75.
(3) With M.O. operating, carefully adjust the grid trimmer until the signal from the M.O. is zero beat with the standard signal. The top should be set on the can to check whether any deviation is obtained. If so, the trimmer should be readjusted until the signal is zero beat with the top in position. The trimmer should be locked after this adjustment has been satisfactorily completed.
(4) With the transmitter in operation, the plate trimmer should be adjusted until the final amplifier grid current is at maximum. This adjustment should be made with the M.O. set to 4000 KC., and the buffer range switch set to Band #1. Adjust the buffer tuning condenser for a maximum reading, (condenser set so that indication is obtained with least amount of capacity) and increase this maximum, if possible with the M.O. plate trimmer. Lock trimmer and replace top.

PARTS LIST T-350XM TRANSMITTER

Circuit Symbol	Description	Vendor	Techrad Part No.
C1	Not used		
C2	Capacitor, Variable, with locking nut. Maximum capacity 24 MMF	2	2051
C2A	Capacitor, Fixed, 45 MMF Zero Temperature Coefficient	1	2052
C3	Capacitor, Variable, Maximum capacity 470 MMF, Minimum capacity 20 MMF. With Worm Drive and Bi-metal Compensation	6	A-1267
C4	Capacitor, Variable, Maximum capacity 470 MMF. Minimum capacity 20 MMF. Without Worm Drive and Compensation	6	A-1268
C5	Capacitor, Fixed, 250 MMF Zero Temperature Coefficient	1	2055
C6	Capacitor, Fixed, Mica 10,000 MMF, 300 Volts D.C.	4	2056
C7	Capacitor, Fixed, Mica 50 MMF, 500 Volts	4	2057
C8	Capacitor, Fixed, Mica, 2,000 MMF, 500 Volts	4	2058
C9	Capacitor, Fixed, Paper .05 MFD, 400 Volts	5	2059
C10	Same as C9	5	2059
C11	Same as C9, C10	5	2059
C12	Capacitor, Variable, Maximum capacity 76 MMF	2	2060
C13	Capacitor, Fixed, Mica 2,000 MMF, 1200 Volts	4	2061
C14	Not used		
C15	Capacitor, Fixed, Paper .05, 400 Volts	5	2059
C16	Capacitor, Fixed, Mica 2,000 MMF, 1200 Volts	4	2061
C17	Capacitor, Variable, Maximum capacity 470 MMF. Minimum capacity 20 MMF. Without Worm Drive or Compensation	6	A-1124
C18	Capacitor, Fixed, Mica 2,000 MMF, 1200 Volts	4	2061
C19	Capacitor, Fixed, Mica 2,000 MMF, 1200 Volts	4	2061
C20	Not used		
C21	Capacitor, Fixed, Paper .05 MFD, 400 Volts	5	2059
C22	Capacitor, Fixed, Mica 2,000 MMF, 1200 Volts	4	2061
C23	Capacitor, Variable, Maximum capacity 470 MMF. Minimum capacity 20 MMF. Without Worm Drive or Compensation	6	A-1124
C24	Capacitor, Variable, Maximum capacity 35 MMF.	2	2062
C25	Same as C24	2	2062
C26	Capacitor, Fixed, Mica 2,000 MMF, 1200 Volts	4	2061
C27	Capacitor, Fixed, Mica 100 MMF, 1200 Volts	31	2019
C28	Capacitor, Fixed, Mica 10,000 MMF, 300 Volts	4	2056
C29	Capacitor, same as C28	4	2056
C30	Capacitor, same as C28	4	2056

PARTS LIST T-350XM TRANSMITTER—Continued

Circuit Symbol	Description	Vendor	Techrad Part No.
C31	Capacitor, same as C28	4	2056
C32	Capacitor, Fixed, Mica 2,000 MMF, 2500 Volts	4	2063
C33 C33A	Capacitor, Fixed, Air, 130 MMF C33 — 70 MMF C33A, Single Assembly	6	1123
C35	Capacitor, Fixed, Mica 2,000 MMF, 3000 Volts	4	2065
C36	Capacitor, Fixed, Mica 5,000 MMF, 3000 Volts	4	2066
C37 C37A	Capacitor, Fixed, Air, 820 MMF C37 — 430 MMF C37A, Single Assembly	6	1122
C38 C38A C38B C38C	Capacitor, Fixed, Air, 230 MMF C38, 120 MMF C38A, 40 MMF C38B, 20 MMF C38C, Single Assembly	6	1121
C39	Capacitor, Fixed, Paper .01 MFD, 400 Volts	5	2069
C40	Capacitor, Fixed, Paper .01 MFD, 400 Volts	5	2069
C41	Capacitor, Fixed, Oil Filled 10 MFD, 1500 Volts	7	2070
C42	Capacitor, Fixed, Oil Filled 4 MFD, 2500 Volts	7	2071
C43	Capacitor, Fixed, Oil Filled 4 MFD, 2500 Volts	7	2071
C43A	Capacitor, Fixed, Oil Filled 4 MFD, 2500 Volts	7	2071
C44	Capacitor, Fixed, Oil Filled 6 MFD, 600 Volts	7	2072
C45	Capacitor, Fixed, Oil Filled 6 MFD, 600 Volts	7	2072
C46	Capacitor, Fixed, Mica 2,000 MMF, 500 Volts	4	2058
C47	Capacitor, Fixed, Oil Filled 6 MFD, 600 Volts	7	2072
C48	Capacitor, Fixed, Mica 2,000 MMF, 500 Volts	4	2058
C49	Capacitor, Fixed, Mica 10,000 MMF, 300 Volts	4	2056
R1	Resistor, Fixed, Carbon 1 Watt, 25,000 Ohm	8	2073
R2	Resistor, Fixed, Carbon 1 Watt, 50,000 Ohm	8	2074
R3	Resistor, Fixed, Carbon 1 Watt, 100,000 Ohm	8	2075
R4	Resistor, Fixed, Carbon 1 Watt, 50,000 Ohm	8	2074
R5	Resistor, Fixed, Carbon 1 Watt, 250,000 Ohm	8	2076
R6	Resistor, Fixed, Carbon 1 Watt, 350 Ohm	8	2078
R7	Resistor, Fixed, Carbon 1 Watt, 150 Ohm	8	2084
R8	Not used		
R9	Resistor, Fixed, Carbon 1 Watt, 150 Ohm	8	2084
R10	Resistor, Fixed, Carbon 1 Watt, 50,000 Ohm	8	2075
R11	Resistor, Fixed, Carbon ½ Watt, 25 Ohm	8	2079
R12	Resistor, Fixed, Carbon ½ Watt, 25 Ohm	8	2079
R13	Resistor, Fixed, Carbon ½ Watt, 25 Ohm	8	2079
R14	Not used		
R15	Not used		
R16	Not used		
R17	Not used		
R18	Not used		
R19	Resistor, Fixed, Wirewound 25 Watt, 10,000 Ohm	9	2082
R20	Resistor, Fixed, Wirewound, 80 Watt, 25,000 Ohm	9	2088
R21	Resistor, Fixed, Carbon 1 Watt, 2 Megohm	8	2085

PARTS LIST T-350XM TRANSMITTER—Continued

Circuit Symbol	Description	Vendor	Techrad Part No.
R22	Resistor, Fixed, Carbon 1 Watt, 10,000 Ohm	8	2086
R23	Resistor, Fixed, Carbon 1 Watt, 10,000 Ohm	8	2086
R24	Resistor, Fixed, Wirewound 80 Watt, 50,000 Ohm	9	2087
R25	Resistor, Fixed, Wirewound 80 Watt, 25,000 Ohm	9	2088
R26	Resistor, Fixed, Wirewound 660 Watt, 220 Volts	23	2089
R27	Resistor, Fixed, Wirewound 80 Watt, 25,000 Ohm	9	2088
R28	Resistor, Fixed, Wirewound 5 Watt, 5,000 Ohm	9	2090
R29	Resistor, Fixed, Carbon 1 Watt, 500,000 Ohm	8	2091
R30	Resistor, Fixed, Carbon 1 Watt, 500,000 Ohm	8	2091
R31	Resistor, Fixed, Wirewound 5 Watt, 15,000 Ohm	9	2092
R32	Not used		
R33	Resistor, Fixed, Wirewound 25 Watt, 8,000 Ohm	9	2094
R34	Resistor, Variable, Wirewound 50 Watt, 10,000 Ohm	10	2093
R35	Resistor, Fixed, Wirewound 25 Watt, 15,000 Ohm	9	2095
R36	Resistor, Fixed, Wirewound 5 Watt, 25 Ohm	9	2096
R37	Resistor, Fixed, Wirewound 5 Watt, 25 Ohm	9	2096
R38	Not used		
R39	Not used		
R40	Not used		
R41	Resistor, Variable, Wirewound 100 Watt, 25 Ohm	11	2098
R42	Not used		
R43	Resistor, Fixed, Wirewound 5 Watt, 2,000 Ohm	9	2080
S1, 2, 3, 4	Ceramic Switch, Single Pole, Two Position, Four #88 Sections CW-Phone Switch	12	2118
S5	Ceramic, Double Pole, Two Position, Single #86 Section High-Low Power Switch	12	2119
S7	Ceramic, Two Pole, Two Position. Non-Shorting. Single RR Section. Metering Switch Final Amplifier	1	A-2190
S8, 9, 10	Ceramic, Single Pole, Single Throw. 20 Amp., 220 Volts. Interlock Switch	13	2117
S11	Ceramic, Single Pole, Two Position. Non-Shorting. Four Y Sections. XTAL-MO Switch	1	2018
S12	Ceramic, Two Pole, Three Position. Non-Shorting. Single RR Section. Buffer Metering Switch	1	A-2191
S13	Toggle, Heavy Duty, Double Pole Single Throw. 20 Amp., 250 Volts. Main Power Switch	13	2125
S14, 15, S16, 17	Ceramic, Two Pole, Four Position. Non-Shorting. Four RR Sections. Buffer Band Switch	1	A-1145
S18	Toggle, Double Pole, Double Throw. MO Test Switch	13	2126

PARTS LIST T-350XM TRANSMITTER—Continued

Circuit Symbol	Description	Vendor	Techrad Part No.
S19	Toggle, Single Pole, Single Throw. Send-Receive Switch	13	2127
S20, 21	Ceramic, Single Pole, Three Position. Two #88 Sections. Antenna Series/Parallel Switch	12	2120
S22, 23	Ceramic, Single Pole, Nine Position. Two #88 Sections. Capacity Change Switch	12	2121
S24, 25	Ceramic, Single Pole, Three Position. Two #88 Sections. Final Amplifier Capacity Change Switch	12	2122
S26	Toggle, Double Pole, Double Throw. Same as S18. Test Switch	13	2126
RE1	Keying Relay. Double Pole, Single Throw. 1550 Ohms, 24 Volt D. C.	14	2147
RE2	Power Relay. Double Pole, Single Throw. 6 Volt A. C. Coil.	14	2148
M1	0-100 MA D. C. Millameter, Size 2½"	15	2143
M2	0-500 MA D. C. Millameter, Size 2½"	15	2144
M3	0-15 Volt A. C. Voltmeter, Size 2½"	15	2145
M4	0-8 Amp. Radio Frequency Ammeter, Size 2½"	15	2146
T1	Filament Transformer Primary 210, 230, 250, Volt, 50-Cycle Secondary (a) 6.3 Volts @ 6 Amp. C. T. (b) 5 Volts @ 6 Amp. C. T.	16	2101
T2	Filament Transformer Primary 210, 230, 250, Volt, 50-Cycle Secondary (a) 10 Volts @ 10 Amps. C. T. (b) 10 Volts @ 8 Amps. C. T.	16	2103
T3	High Power Transformer Primary 210, 230, 250 Volts, 50-Cycle Secondary Tapped to Produce 1250/1500, 2000 Volts at 800 MA from Filter. First Mode of Operations: 2000 Volts Output @ 430 MA 1500 and 1200 Taps Not Used. Regulation 150 Volt Rise When Current is Dropped to 50 MA. 866 Type Rectifiers. Second Mode: 1500 Volts Output at 400 MA. Both Used Simultaneously	16	2104
T4	Filament Transformer Primary 210, 230, 250 Volts, 50-Cycle. Secondary (a) 2.5 Volts @ 10 Amp. C. T. (b) 2.5 Volts @ 10 Amp. C. T.	16	2102
CH2	Filter Choke, 10 Henries plus minus 20% @ 400 MA	16	2105
CH1, 3	Filter Choke, 20 Henries plus minus 20% Swinging Choke Zero Signal Current 150 MA Maximum Signal Current 400 MA	16	2106

PARTS LIST T-350XM TRANSMITTER—Continued

Circuit Symbol	Description	Vendor	Techrad Part No.
T5	Medium Power Transformer Primary 210, 230, 250 Volts, 50-Cycle. Secondary Furnishes 500 Volts from Filter @ 225 MA	16	2107
CH4, 5	Filter Choke, plus minus 20% 10 Henries @ 225 MA Circuit S	16	2108
T6	Bias Transformer Primary 210, 230, 250 Volts, 50-Cycle Secondary (a) 250-0-250 Volt @ 40 MA (b) 5 Volts @ 3 Amp.	16	2109
T7	Modulation Transformer (300 Watts) Primary 6700 OHMA Plate to Plate Class B. Secondary 0-4500-5000-5500 OHMA D. C. Through Secondary 350 MA	16	2110
T8	Driver Transformer, 500 Ohm Line to 805 Grids, Split Secondary Frequency Response Flat from 400 to 4000 cycles. (Turns Ratio Primary to Total Secondary 1: 2.7 Approximately)	16	2111
	Fixed Inductors Wound on Special Glass Forms		
L1	M. O. Grid Coil	6	1135
L2	M. O. Plate Coil	6	1136-A
L3	2/4 Megacycle Buffer Coil	6	1136-B
L4	4/8 Megacycle Buffer Coil	6	1137
L5	8/16 Megacycle Buffer Coil	6	1138
L6	12/24 Megacycle Buffer Coil	6	1139
L7	Variable Inductor 24.365	17	2183
L8	Variable Inductor 24.306-1	17	2182
L9	Variable Inductor 24.306-2	17	2181
RFC1, 2, 3, 5, 6	Radio Frequency Choke, 2.5 MH, 26 Ohms, 200 MA	18	2115
RFC4	Radio Frequency Choke, 2.0 MH, 6.5 Ohms, 400 MA	18	2116
F1, 2	Fuse, Cartridge, Non-renewable. 3 Amp, 250 Volt	24	2166
F3, 4	Fuse, Cartridge, Non-renewable. 15 Amp. 250 Volt	24	2165
7	Tube Sockets, 8 Prong, Mica Filled Stainless Steel Mounting Plates. Silver Contacts. Military Type M1P8T For Vacuum Tubes Type VR105/30, VR150/30, 6SJ7, 6J5, 6SK7, 6L6GA	21	2151
2	Tube Sockets, 5 Prong, Mica Filled Stainless Steel Mounting Plates. Silver Contacts Military Type M1P5T Five Prong Tube Socket for Type 807	21	2152
3	Tube Sockets, 4 Prong, Mica Filled Stainless Steel Mounting Plates. Silver Contacts. Military Type M1P4T Four Prong Tube Socket for Vacuum Type Tube 5Z3	21	2154

PARTS LIST T-350XM TRANSMITTER—Continued

Circuit Symbol	Description	Vendor	Techrad Part No.
2	Tube Sockets, 7 Prong, "G" Grade Wax Impregnated Steatite #237 Tube Socket for Vacuum Type Tube 813	17	2155
2	Tube Socket, 50 Watt Base, Steatite Beryllium Copper Contacts, 4 Prong #211SB Tube Socket for Vacuum Type Tube 805	17	2156
4	Tube Sockets, 50 Watt Base, Steatite Beryllium Copper Contacts, UX Base #209SB Tube Socket for Vacuum Type Tube 866A	17	2157
5	Crystal Holder Socket. Black Bakelite, Silver Plated Contacts, 33-2 Socket for Crystals	21	2153
4	Interpolating Dial Used in Conjunction with Variable Inductors and Master Oscillator Condensers. Dial Graduated 0-100 with 200 Readable Parts	6	1146
	Ceramic Screw Base Socket For R26	23	2089
1	Set Pyrex Antenna Entrance Bowl	20	2025
VT1, 2, 3, 4	866A	30	2167
VT5, 6	805	15	2168
VT7, 8	813	15	2169
VT9, 10	VR-105/30	32	2171
VT11	VR-150/30	32	2172
VT12, 13	807	32	2173
VT14	6SJ7	33	2174
VT15	6J5	33	2175
VT16	6SK7	34	2177
VT17	6L6GA	34	2178
VT18, 19, 20	5Z3	35	2179
	Concentric Line Connector, Type SC153	37	2028
	Antenna Network Panel, Physical Dimension 9 31/32 x 13 3/4", 8 ga. 24 ST Dural	6	1212
	Final Amplifier Panel, Physical Dimension 11 31/32 x 13 3/4", 8 ga. 24 ST Dural	6	1213
	Buffer Panel, Physical Dimension 9 23/32 x 13 3/4", 8 ga. 24 ST Dural	6	1214
	Power Panel, Physical Dimension 19 27/32 x 13 3/4", 8 ga. 24 ST Dural	6	1215
4	Molded black Bakelite knobs, with handles. 1/4" insert without slot.	6	1297
1	Molded black Bakelite knob with handles. 3/8" insert without slot.	6	1298
5	Molded black Bakelite knob without handles. 1/4" insert with slots.	6	1299

PARTS LIST T-350XM TRANSMITTER—Concluded

Circuit Symbol	Description	Vendor	Techrad Part No.
1	Molded black Bakelite knob without handle. 1/4" insert without slot.	6	1300
6	Molded black Bakelite knob, pointer. 1/4" insert.	31	2184
28	Ceramic through panel bushing, complete with plated threaded rod and nuts.	17	2036
4	Ceramic flexible couplings. 1 1/4" wide. Insert for 1/4" x 1/4" shaft.	17	2037
1	Ceramic flexible coupling. 2 1/4" wide. Insert for 1/4" x 3/8" shaft.	17	2038
1	Ceramic solid coupling. 11/16" diameter x 1 1/4" long. For 1/4" shaft each end.	17	2014

PARTS LIST FOR 350XM SPEECH CONSOLE

Circuit Symbol	Description	Vendor	Part No.
C-1	Capacitor, electrolytic, 40 MF., 150v. Twist lock type	26	2218
C-2	Capacitor, fixed mica, 560 MMFD, 400v.	4	2058
C-3	Same as C-1		
C-4	Capacitor, fixed paper, 0.1 MFD., 500v	5	2059
C-5	Not used		
C-6	Same as C-1		
C-7	Same as C-4		
C-8	Not used		
C-9	Same as C-4		
C-10	Same as C-1		
C-11	Capacitor, fixed paper, .0025 MFD., 1000 v.	27	2219
C-12	Same as C-11		
C-13	Capacitor, electrolytic, 30MFD., 450 v.	26	2217
C-14	Same as C-13		
C-15	Capacitor, electrolytic, 20 MFD., 450 v.	26	2216
C-16	Capacitor, electrolytic, 10 MFD., 450v.	26	2215
C-17	Same as C-16		
C-18	Capacitor, fixed paper, 1.0 MFD., 150 v.	29	3017

C-19	Not used		
C-20	Not used		
C-21	Same as C-2		
C-101	Capacitor, electrolytic, 8.0 MFD., 450 v.	39	3006
C-102	Capacitor, fixed paper, .005MFD., 100 v.	39	3015
C-103	Capacitor, fixed paper, 0.1 MFD., 400 v.	39	3018
C-104	Capacitor, fixed paper, 0.01 MFD., 200 v.	39	3019
C-105	Same as C-103		
C-106	Same as C-103		
C-107	Capacitor, fixed paper, 0.22 MFD., 200 v.	7	3020
C-108	Same as C-103		
C-109	Capacitor, fixed paper, 0.47 MFD., 100 v., Part No. WMF 1P47E	39	3016
C-112	Same as C-111		
C-201	Capacitor, fixed ceramic, 470 MMFD., 200 v.	17	3022
C-202	Same as C-201		
C-203	Capacitor, fixed paper, 1.0 MFD., 200 v.	17	3023
F-1	Fuse, glass, 3 amperes, 250 v., Style 3 AG	19	2209 3024
I-1	Lamp, bayonet, 6.3 v., Part No.47	15	3025
J-101	Jack, hi-fi type, 3-position Part No. 1212, for key, and key and side tone	40	3007
J-102	Same as J-101		

J-103	Same as J-101		
J-104	Same as J-101 except used for mute, anti-VOX and spare		
J-105	Same as J-104		
J-106	Same as J-104		
J-201	Jack, microphone input, Part No.48	21	3026
J-7	Fuse holder, panel mount, for 3AG fuse Part No. HKP	24	3008
J-8	Holder, pilot light, bayonet type, panel mount, clear Part No. 80	41	3011
L-201	Choke, 4.7 microhenries	17	3013
RY-1	Relay, VOX control, 10,000 ohms, D.C. operated; contacts DPST	42	3027
R-1	Resistor, fixed carbon, 1,500 ohms, ½ watt, 10% tol., BT½	28	2206
R-2	Resistor, fixed carbon, 100,000 ohms, 1 watt, 10% tol., BT-1	8	2075
R-3	Resistor, variable, carbon, 250,000 ohms, linear taper, 3/8" bushing, ½" shaft	1	2207
R-4	Resistor, fixed carbon, 100 ohms, ½ watt, 10% tol., BT-½	28	2205
R-5	Resistor, fixed carbon, 47,000 ohms, 1 watt, 10% tol., BT ½	8	2074
R-6	Resistor, fixed carbon, 470,000 ohms, ½ watt, 10% tol., BT ½	28	2204
R-7	Not used		
R-8	Resistor, fixed carbon, 2,700 ohms, ½ watt, 10% tol.,	28	2203
R-9	Same as R-8		
R-10	Resistor, fixed carbon, 82,000 ohms, 1 watt, 10% tol., BT-1	37	3028
R-11	Same as R-10		

R-12	Resistor, fixed carbon, 150,000 ohms, ½ watt, 10% tol., BT½	28	2202
R-13	Resistor, fixed carbon, 12,000 ohms ½ watt, 10% tol., BT½	28	2200
R-107	Resistor, fixed carbon, 100,000 ohms, 1 watt, 10% tol., BT-½	28	3040
R-108	Same as R-107		
R-109	Resistor, fixed carbon, 100,000 ohms, ½ watt, 10% tol., BT-½	28	3042
R-110	Same as R-109		
R-111	Resistor, fixed carbon, 220 ohms, ½ watt, 10% tol., BT-½	28	3043
R-112	Resistor, fixed carbon, 330 ohms, 1 watt 10% tol., BT-1	28	3044
R-113	Resistor, fixed carbon, 2.2 Megohms, ½ watt, 10% tol., BT-½	28	3045
R-114	Resistor, fixed carbon, 3.3 Megohms, ½ watt, 10% tol., BT-½	28	3046
R-115	Resistor, fixed carbon, 1.5 Megohms, ½ watt, 10% tol., BT-½	28	3047
R-116	Same as R-115		
R-117	Same as R-2		
R-118	Resistor, fixed carbon, 2,200 ohms, ½ watt, 10% tol., BT-½	28	3048
R-119	Resistor, fixed carbon, 7,500 ohms, 1 watt, 10% tol., BT-1	28	3049
R-120	Resistor, fixed carbon, 1,200 ohms, 1 watt, 10% tol., BT-1	37	3050
R-121	Resistor, fixed carbon, 47,000 ohms, ½ watt, 10% tol., BT-½	28	3051
R-122	Resistor, variable carbon, 100,000 ohms, linear, ½" shaft, 3/8-32 bushing	1	3052

R-201	Resistor, fixed carbon, 220 ohms, ½ watts, 10% tol., BT-½	28	3053
R-202	Same as R-201		
R-203	Resistor, fixed carbon, 820 ohms, ½ watt, 10% tol., BT-½	28	3054
R-204	Resistor, variable carbon, 2000 ohms, linear	1	3055
R-205	Resistor, variable carbon, 1 Megohm linear	1	3056
R-206	Not used		
R-207	Resistor, variable carbon, 200 ohms, linear	1	3057
R-208	Resistor, fixed carbon, 33 ohms, ½ watt, 10% tol., BT½	28	3059
R-210	Resistor, fixed carbon, 33 ohms, ½ watt, 10% tol., BT-½	28	3060
S-1	Switch, power, toggle, SPDT, bat handle Part No. 21350	43	2208
S-101	Switch, CW/PHONE, toggle, DPST, bat handle, Part No. 20902	43	3009
S-201	Switch, Mic/Telephone, rotary	17	3010
SO-1	Socket, Jewel, Part No.80	41	3061
T-1 (T-9)	Transformer Speech Output, Primary 5,000 ohms, plate to plate secondary (a) 0,5,7.5,15, 500 ohms (b) Winding for 10% inverse feedback,Hermetically sealed		2112
T-2 (T-10)	Transformer Speech Input, primary; 30, 250 ohms; split at center with imped. symm. arranged each side of center; 25 MA D.C.; currents thru 2 halves of primary; hermetically sealed; electrostatic shielded level: minus 65DB.		2113

T-3 (T-11)	Transformer, Power Speech, amplifier, primary 210, 230, 250 volts, 50 cycles; secondary (a) 350-0-350 at 150 MA; (b) 5 volts at 3 Amp. (c) 6.3 volts at 3.5 Amps. C.T.		2114
T-101	Transformer, audio, sidetone oscillator Part No. 8281	44	3062
T-201	Transformer, receiver coupling	17	3030
T-202	Transformer, transmitter coupling	17	3031
VT-1	Tube, voltage amplifier, metal 6J7	15	2176
VT-2	Same as VT-1		
VT-3	Tube, phase inverter, metal 6J7	15	2177
VT-4	Same as VT-3		
VT-5	Tube, power amplifier, glass, 6L6G	15	2178
VT-6	Same as VT-5		
VT-7	Tube, rectifier, glass, 5U4G	15	2180
VT-101	Tube, limiter, glass, 6AL5	15	3001
VT-102	Tube, VOX ANTI-VOX, amplifier, glass 12AT7	15	3002
VT-103	Tube, VOX, ANTI-VOX, rectifier, glass 6AL5	15	3001
VT-104	Tube, VOX relay and sidetone oscillator, glass, 12AT7	15	3002

PARTS LIST FOR CIRCUIT BREAKER PANEL
PART NUMBER 3003

BX-1	Box, circuit breaker, MP Load center	45	3004
CB-1	Circuit breaker, 20 AMPS, AC, 110 volts	46	3005

PARTS LIST FOR POWER TRANSFORMER
PART NUMBER 3029

T-301	Transformer, 50/60 cycles; 240/220/200 volts, 115 volts, single phase, 2KVA, 48 lbs.	46	3033
SO-301	Receptacle, transmitter, 20 amps., twist lock type, 3 wire	22	3032
SO-302	Receptacle, speech console, 10 amps., twist lock type, 3 wire, 220 volts	22	3034
SO-303	Receptacle, receiver, 10 amps., 110 volts	22	3035
TB-301	Terminal board, 7 terminal, part #7-141	48	3014

PARTS LIST FOR MICROPHONE

P-401	Connector, microphone, Part No. 80-MC2M	21	3064
MK-1	Microphone, dynamic, Part No. 9D	49	3063

INDEX OF MANUFACTURERS

1 Centralab
Milwaukee, Wisconsin

2 American Steel Pkg. Co.
Defiance, Ohio

3 Les Logan
San Francisco, Calif.

4 Solar Mfg. Co.
Bayonne, N.J.

5 Micamold Radio Corp.
Brooklyn, N.Y.

6 Technical Radio Company
San Francisco, Calif.

7 Industrial Condenser
Chicago, Ill.

8 Stackpole
St. Mary's, Pa.

9 Groves Corporation
Cape Girardeau, Mo.

10 Ohmite Mfg. Co.
Chicago, Illinois

11 Hardwick-Hindle Co.
Newark, N.J.

12 Communication Prod.
Newark, N.J.

13 Hart & Hegeman
Hartford, Conn.

14 Leach Relay Co.
Los Angeles, Calif.

15 General Electric Co.
San Francisco, Calif.

16 Thermador Elec. Co.
Los Angeles, Calif.

17 E.F. Johnson Co.
Waseca, Minn.

18 J.W. Miller Co.
Los Angeles, Calif.

19 Littlefuse Co.
Chicago, Illinois

20 Corning Glass Works
Corning, N.Y.

21 American Phenolic Corp.
Chicago, Illinois

22 Harvey Hubell, Inc.
Bridgeport, Conn.

23 Rodale Mfg. Company
Los Angeles, Calif.

24 Bussman Mfg. Co.
St. Louis, Mo.

25 Isolantite, Inc.
Belleville, N.J.

26 Glenn-Roberts
Oakland, Calif.

28 Allen-Bradley
Milwaukee, Wisconsin

29 Girard-Hopkins
Oakland, Calif.

30 Government Field Equip.
Army Service Force
Ogden, Utah

31 Crowe Name Plate
Chicago, Illinois

32 Hytron Corporation
Salem, Mass.

33 Ken-Rad Tube Company
Owensboro, Ky.

34 Sylvania Elec. Co.
Los Angeles, Calif.

35 Tung-Sol Lamp Works
Los Angeles, Calif.

36 Gothard Mfg. Company
Springfield, Illinois

37 International Resistor
Philadelphia, Pa.

38 Autodyne Eng. & Mfg. Co.
Bethpage, N.Y.

39 Cornell-Dubilier Corp.
Plainfield, N.J.

40 H.H. Smith Co.
Brooklyn, N.Y.

41 Drake Mfg. Co.
Chicago, Illinois

42 North Electric Co.
Mineola, N.Y.

43 Arrow Hart & Hageman Corp.
Hartford, Conn.

44 Chicago Transformer Co.
Chicago, Illinois

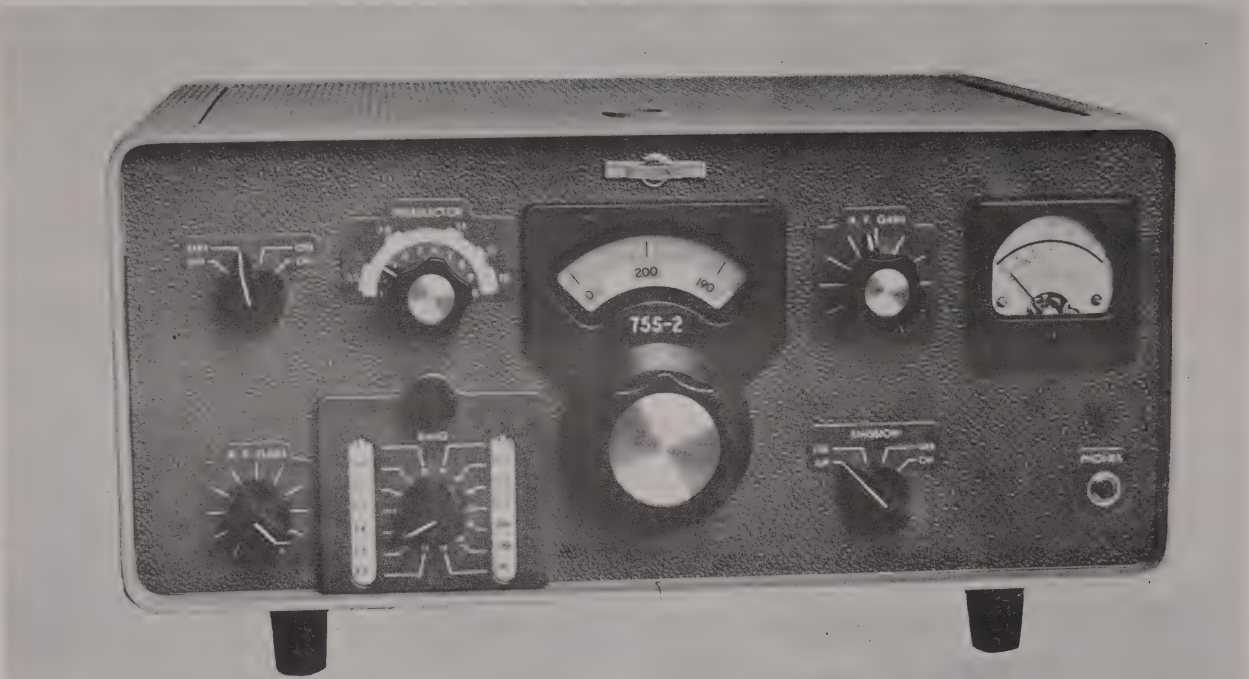
45 Murray Mfg. Corp.
Brooklyn, N.Y.

46 I-T-E Circuit Breaker Corp.
Philadelphia, Pa.

47 Acme Transformer Corp.
Cuba, N.Y.

48 Cinch Mfg. Corp.
Chicago, Illinois

49 Turner Corp.
Cedar Rapids, Iowa



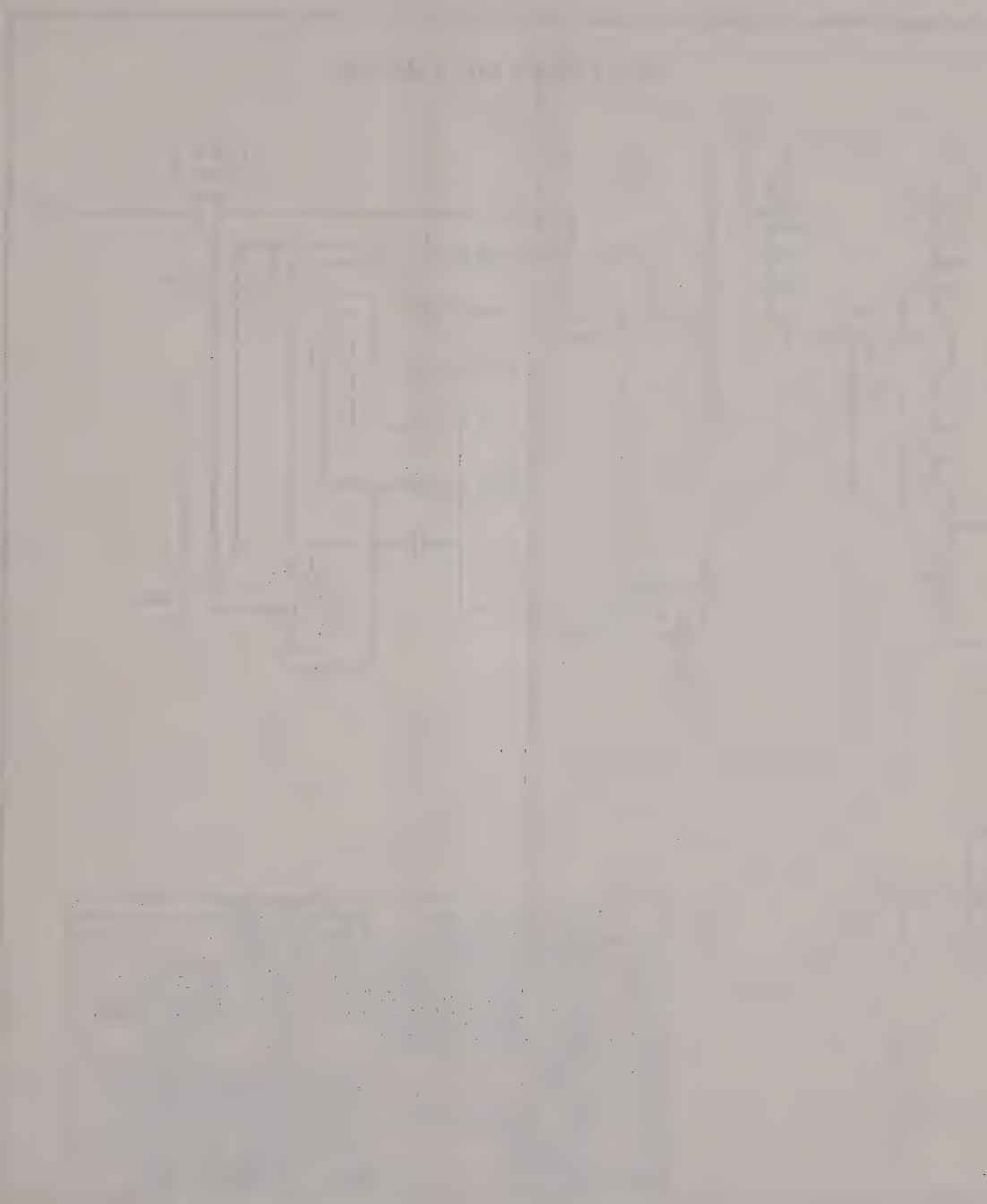
COLLINS RADIO RECEIVER 75S2

NUMBER	LOCATION (1)	TERMINAL	TITLE	LOCATION (2)	TERMINAL	TITLE	TYPE	LENGTH
1	75S2 Receiver	RCA	J8, 4OHM Audio	Speech Console (Phone Patch)	#6 spade Lug	Recr & Ground	Hi-Fi	6 Ft
2	75S2 Receiver	RCA	J5 Antenna	Antenna Relay	PL259	Receiver	Coax	10 Ft
3	75S2 Receiver	RCA	J10 Sidetone	Speech Console	RCA	Sidetone	Hi-Fi	6 Ft
4	75S2 Receiver	RCA	J11 Mute	Speech Console	RCA	Mute	Hi-Fi	6 Ft
5	75S2 Receiver	RCA	J12 Anti-VOX	Speech Console	RCA	Anti-VOX	Hi-Fi	6 Ft
6	Transmitter	#8 Spade	Remote Switch	Antenna Relay	Solder Terminal	Control	Twisted pair	8 Ft
7	Transmitter	#8 Spade	Auto-Key	Speech Console	RCA	Key	Hi-Fi	10 Ft
8	Transmitter	$\frac{1}{4}$" Spade	220 Volt	Power Trans-former	Twist Lock	Power	Types 3 Cond	8 Ft
9	Transmitter	#8 Spade	Audio	Speech Console	#8 Spade	Audio	2 Con-ductor Shielded	10 Ft

TABLE I - LIST OF CABLE ASSEMBLIES

NUMBER	LOCATION (1)	TERMINAL	TITLE	LOCATION (2)	TERMINAL	TITLE	TYPE	LENGTH
10	Speech Console	#8 Spade	Antenna Relay	Antenna Relay	Solder Terminal	Control	Twisted Pair	10 Ft
11	Speech Console	#8 Spade	220 Volt	Power Transformer	Twist Lock	Power	Types 3 Cond #16	8 Ft
12	Speech Console	RCA	Key	Hand Key	Tin Ends	Key	Hi-Fi	6 Ft
13	Speech Console (Patch)	#6 Spade Lugs	L1 L2	Telephone	Tin Ends	Telephone	Twisted Pair shielded	25 Ft
14	Speech Console (Patch)	#6 Spade Lugs	Speaker-ground	Speaker	Tin Ends (observe polarity)	Speaker Ground	Hi-Fi	8 Ft
15	Speech Console (Patch)	Connector	Microphone	Microphone	Connector	Mic	Shielded 2 cond	7 Ft
16	Power Transformer	Twist Lock	110 Volts	Circuit Breaker Box	Terminal	Power	Types 3 Cond #12	7 Ft
17	Transmitter	Lug	Ground	Earth Ground	Lug	Earth Ground	BRAID	6 Ft

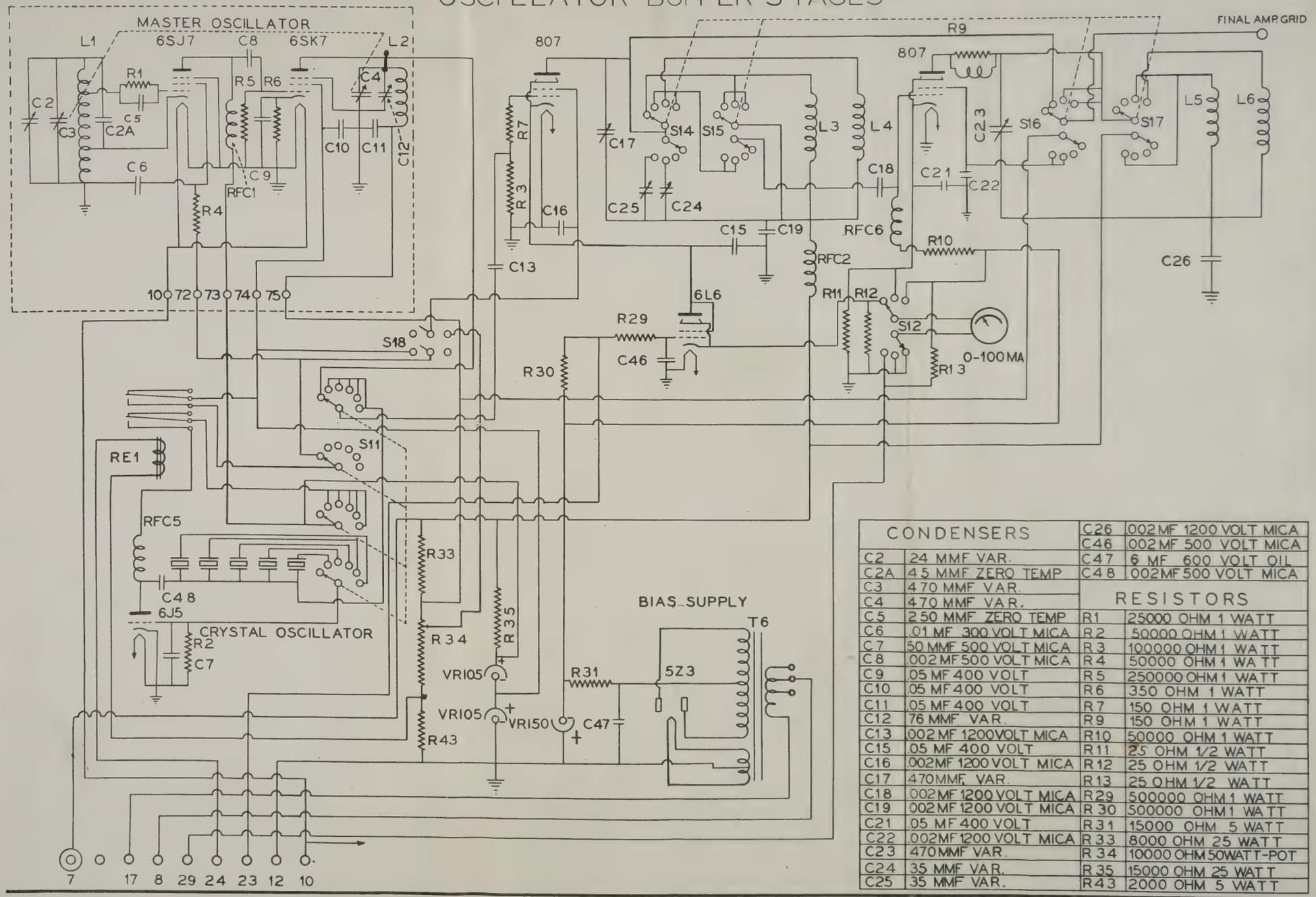
TABLE I - LIST OF CABLE ASSEMBLIES
(Cont)



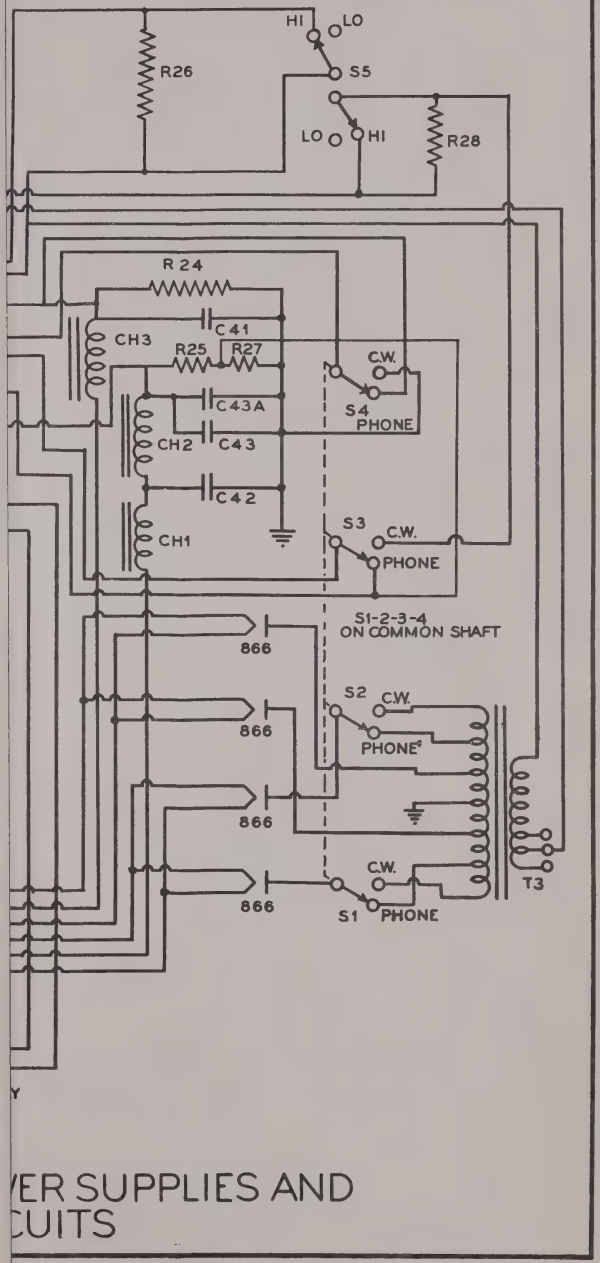
NUMBER	LOCATION (1)	TERMINAL	TITLE	LOCATION (2)	TERMINAL	TITLE	TYPE	LENGTH
10	Speech Console	#8 Spade	Antenna Relay	Antenna Relay	Solder Terminal	Control	Twisted Pair	10 Ft
11	Speech Console	#8 Spade	220 Volt	Power Transformer	Twist Lock	Power	Types 3 Cond #16	8 Ft
12	Speech Console	RCA	Key	Hand Key	Tin Ends	Key	Hi-Fi	6 Ft
13	Speech Console (Patch)	#6 Spade Lugs	L1 L2	Telephone	Tin Ends	Telephone	Twisted Pair shielded	25 Ft
14	Speech Console (Patch)	#6 Spade Lugs	Speaker-ground	Speaker	Tin Ends (observe polarity)	Speaker Ground	Hi-Fi	8 Ft
15	Speech Console (Patch)	Connector	Microphone	Microphone	Connector	Mic	Shielded 2 cond	7 Ft
16	Power Transformer	Twist Lock	110 Volts	Circuit Breaker Box	Terminal	Power	Types 3 Cond #12	7 Ft
17	Transmitter	Lug	Ground	Earth Ground	Lug	Earth Ground	BRAID	6 Ft

TABLE I - LIST OF CABLE ASSEMBLIES
(Cont)

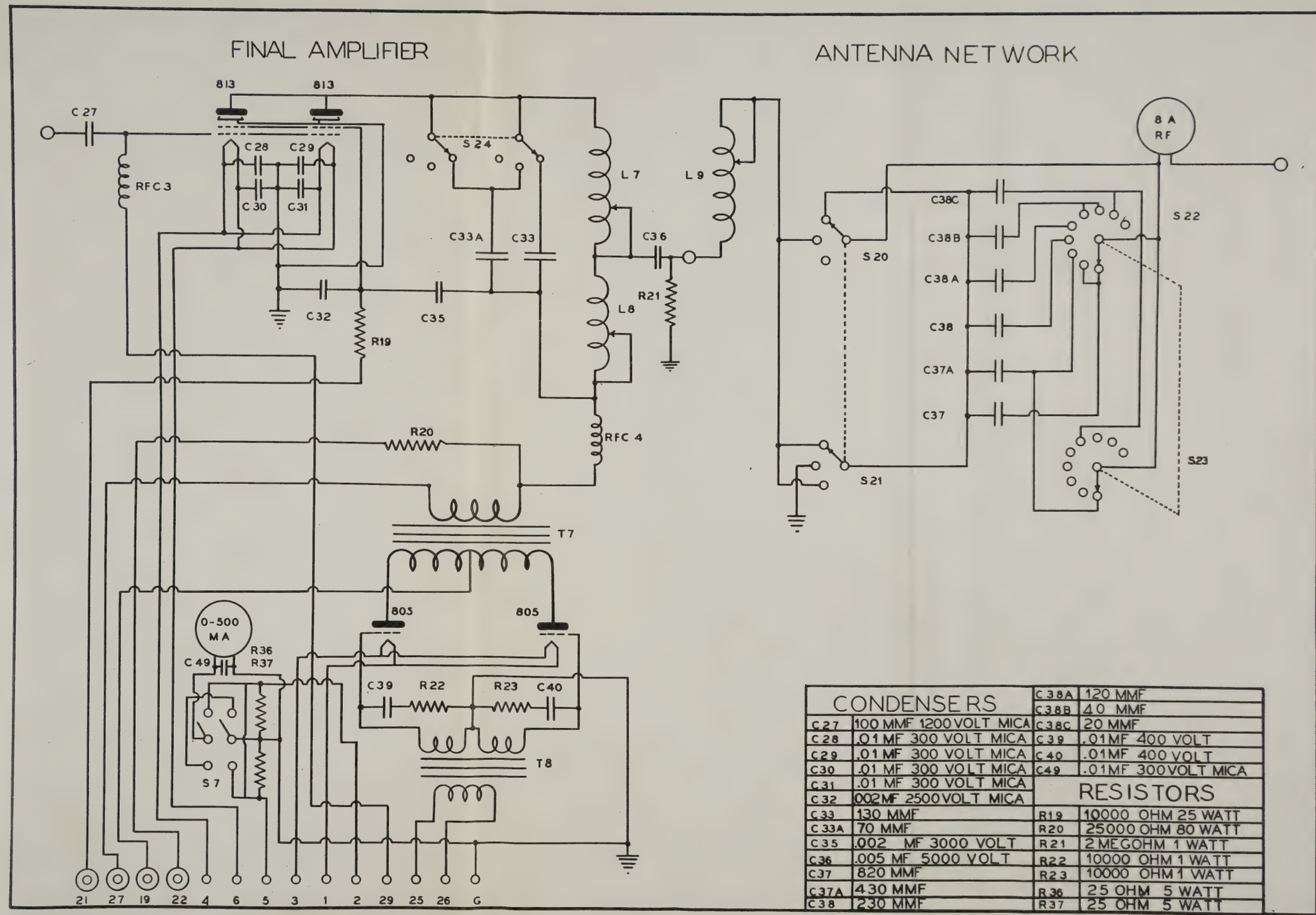
OSCILLATOR-BUFFER STAGES



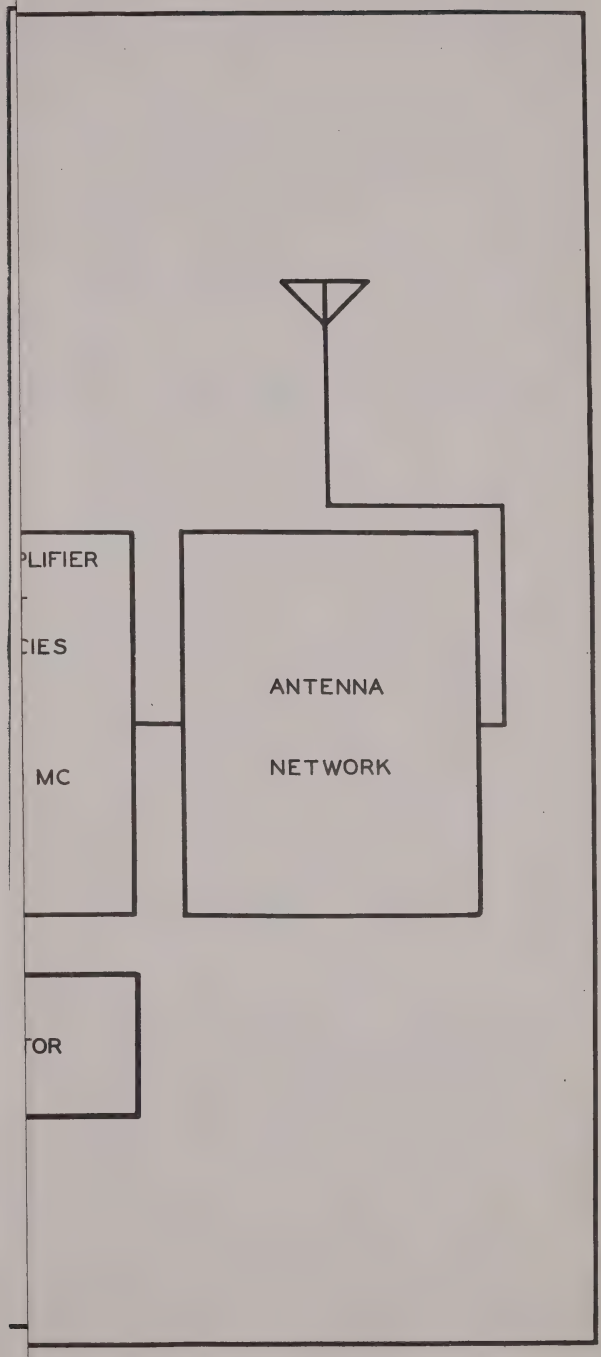
CONDENSERS			
C2	24 MMF VAR.	C26	.002 MF 1200 VOLT MICA
C2A	45 MMF ZERO TEMP	C46	.002 MF 500 VOLT MICA
C3	470 MMF VAR.	C47	6 MF 600 VOLT OIL
C4	470 MMF VAR.	C48	.002 MF 500 VOLT MICA
C5	250 MMF ZERO TEMP	RESISTORS	
C6	.01 MF 300 VOLT MICA	R1	25000 OHM 1 WATT
C7	50 MMF 500 VOLT MICA	R2	50000 OHM 1 WATT
C8	.002 MF 500 VOLT MICA	R3	100000 OHM 1 WATT
C9	.05 MF 400 VOLT	R4	50000 OHM 1 WATT
C10	.05 MF 400 VOLT	R5	250000 OHM 1 WATT
C11	.05 MF 400 VOLT	R6	350 OHM 1 WATT
C12	76 MMF VAR.	R7	150 OHM 1 WATT
C13	.002 MF 1200 VOLT MICA	R9	150 OHM 1 WATT
C15	.05 MF 400 VOLT	R10	50000 OHM 1 WATT
C16	.002 MF 1200 VOLT MICA	R11	25 OHM 1/2 WATT
C17	470 MMF VAR.	R12	25 OHM 1/2 WATT
C18	.002 MF 1200 VOLT MICA	R13	25 OHM 1/2 WATT
C19	.002 MF 1200 VOLT MICA	R29	500000 OHM 1 WATT
C21	.05 MF 400 VOLT	R30	500000 OHM 1 WATT
C22	.002 MF 1200 VOLT MICA	R31	15000 OHM 5 WATT
C23	470 MMF VAR.	R33	8000 OHM 25 WATT
C24	35 MMF VAR.	R34	10000 OHM 50 WATT-POT
C25	35 MMF VAR.	R35	15000 OHM 25 WATT
		R43	2000 OHM 5 WATT

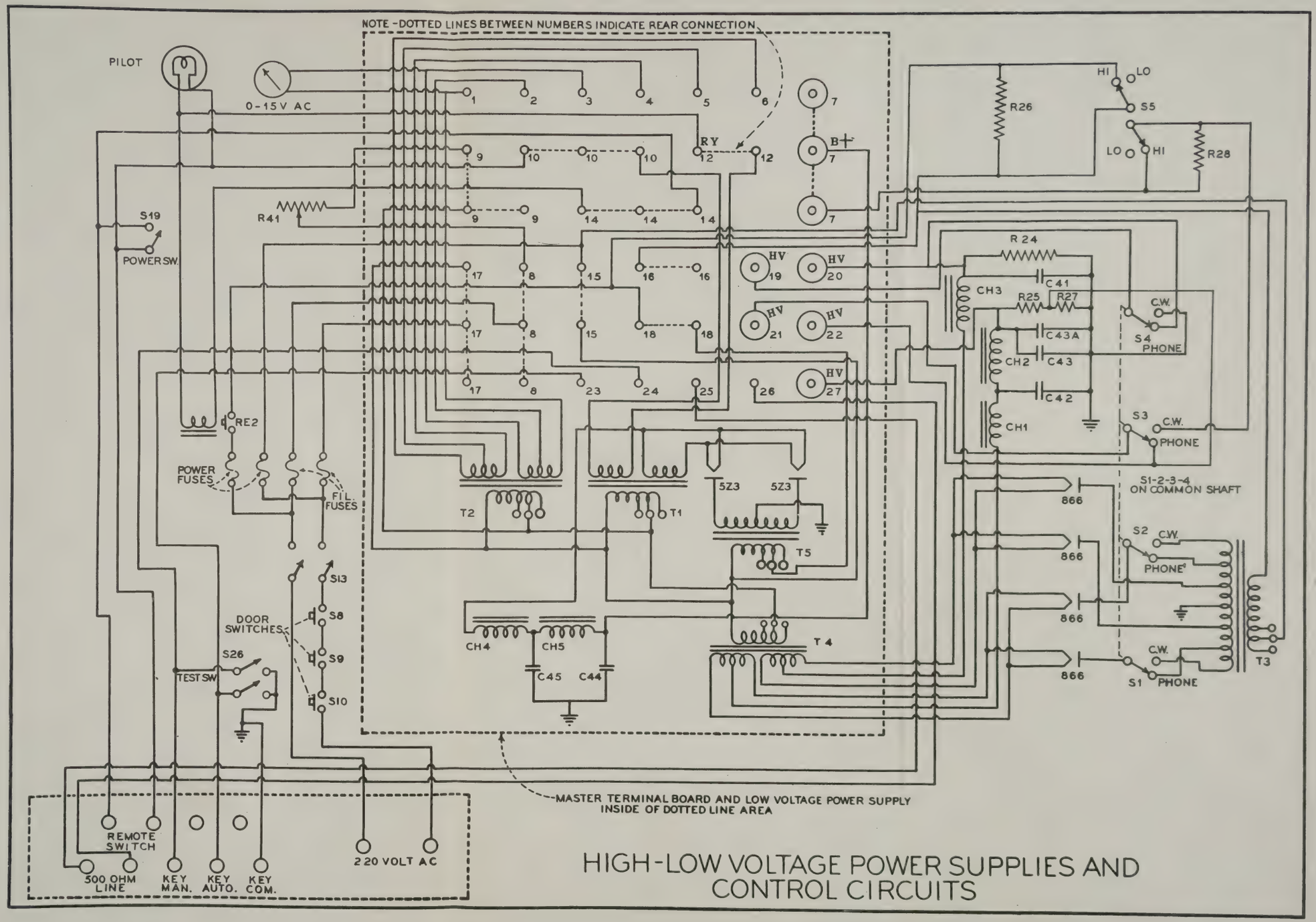


VER SUPPLIES AND
CUITS



CONDENSERS			
C27	100 MMF 1200 VOLT MICA	C38A	120 MMF
C28	.01 MF 300 VOLT MICA	C38B	40 MMF
C29	.01 MF 300 VOLT MICA	C38C	20 MMF
C30	.01 MF 300 VOLT MICA	C39	.01MF 400 VOLT
C31	.01 MF 300 VOLT MICA	C40	.01MF 400 VOLT
C32	.002MF 2500 VOLT MICA	C49	.01MF 300 VOLT MICA
C33	130 MMF	RESISTORS	
C33A	70 MMF	R19	10000 OHM 25 WATT
C35	.002 MF 3000 VOLT	R20	25000 OHM 80 WATT
C36	.005 MF 5000 VOLT	R21	2 MEGOHM 1 WATT
C37	820 MMF	R22	10000 OHM 1 WATT
C37A	430 MMF	R23	10000 OHM 1 WATT
C38	230 MMF	R36	25 OHM 5 WATT
		R37	25 OHM 5 WATT

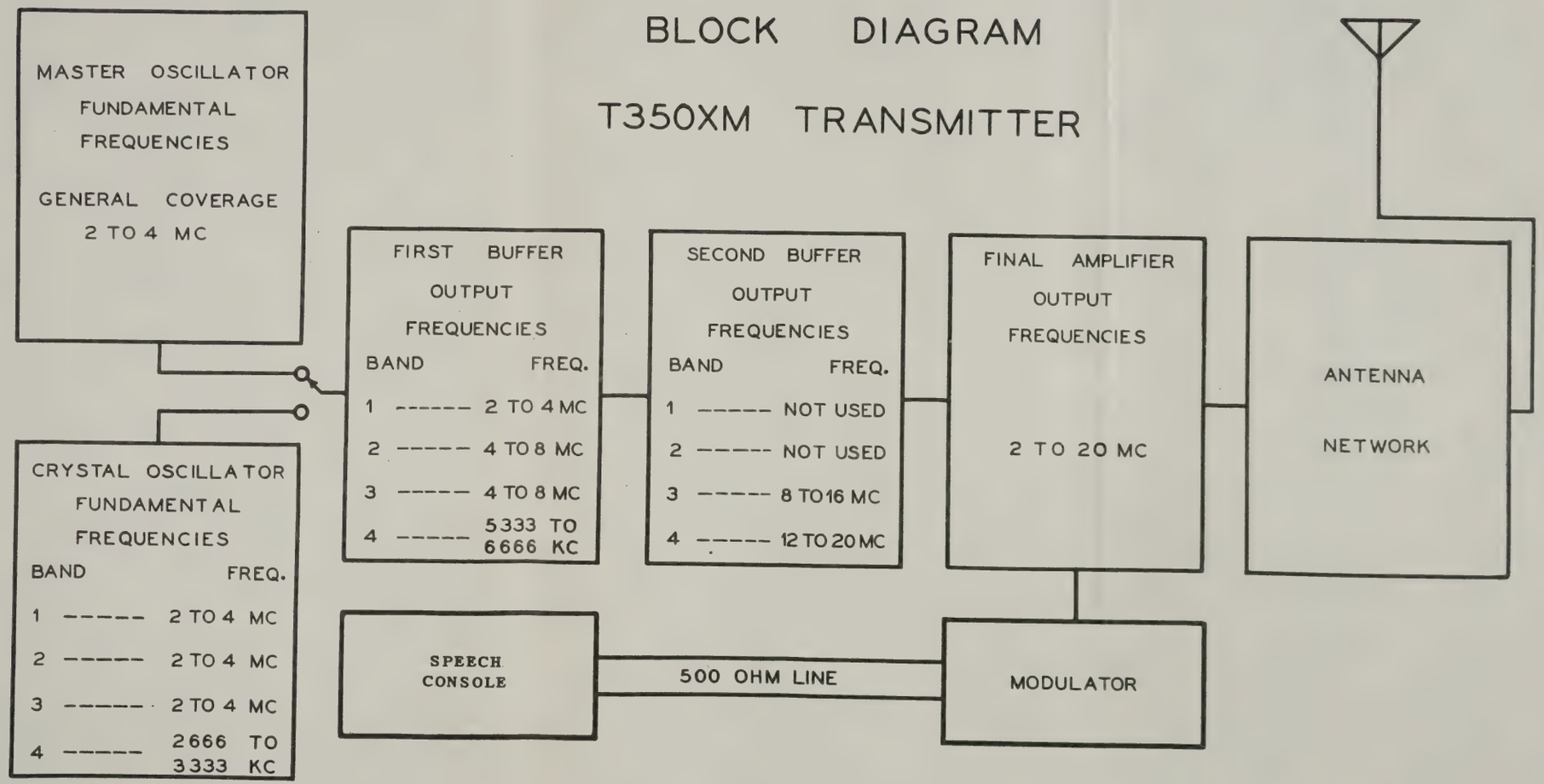

PLIFIER
CIES
MC
ANTENNA
NETWORK
TOR

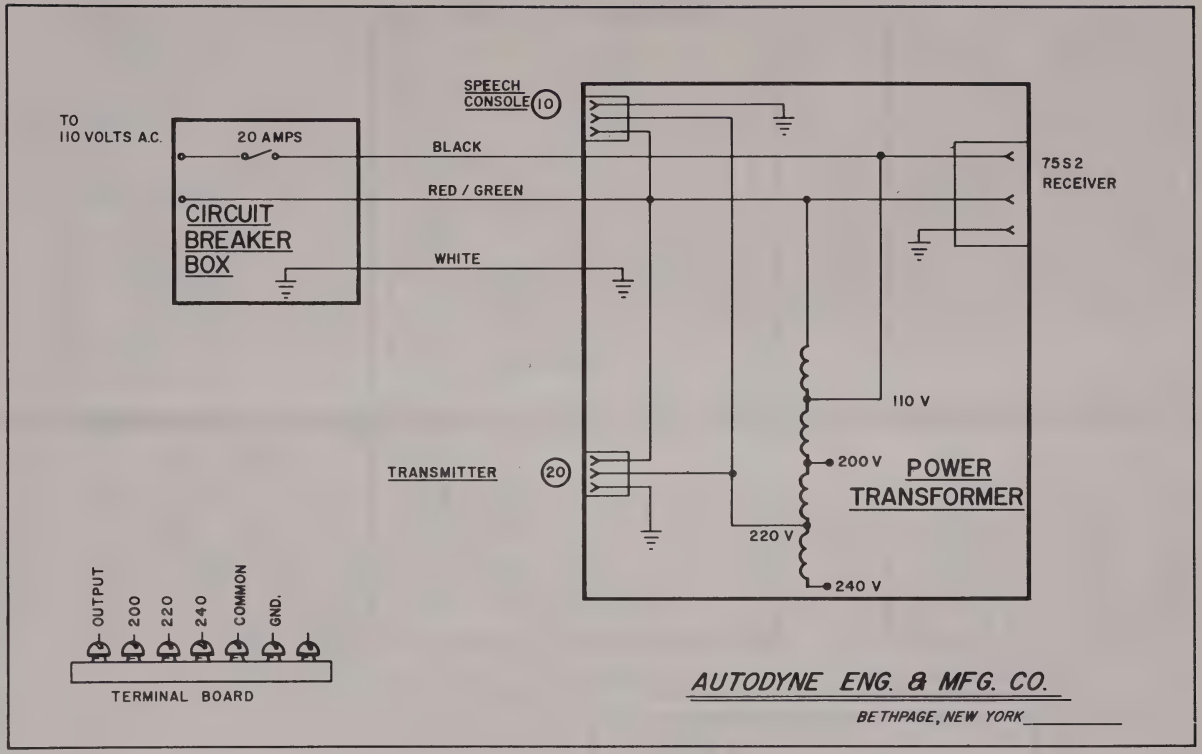


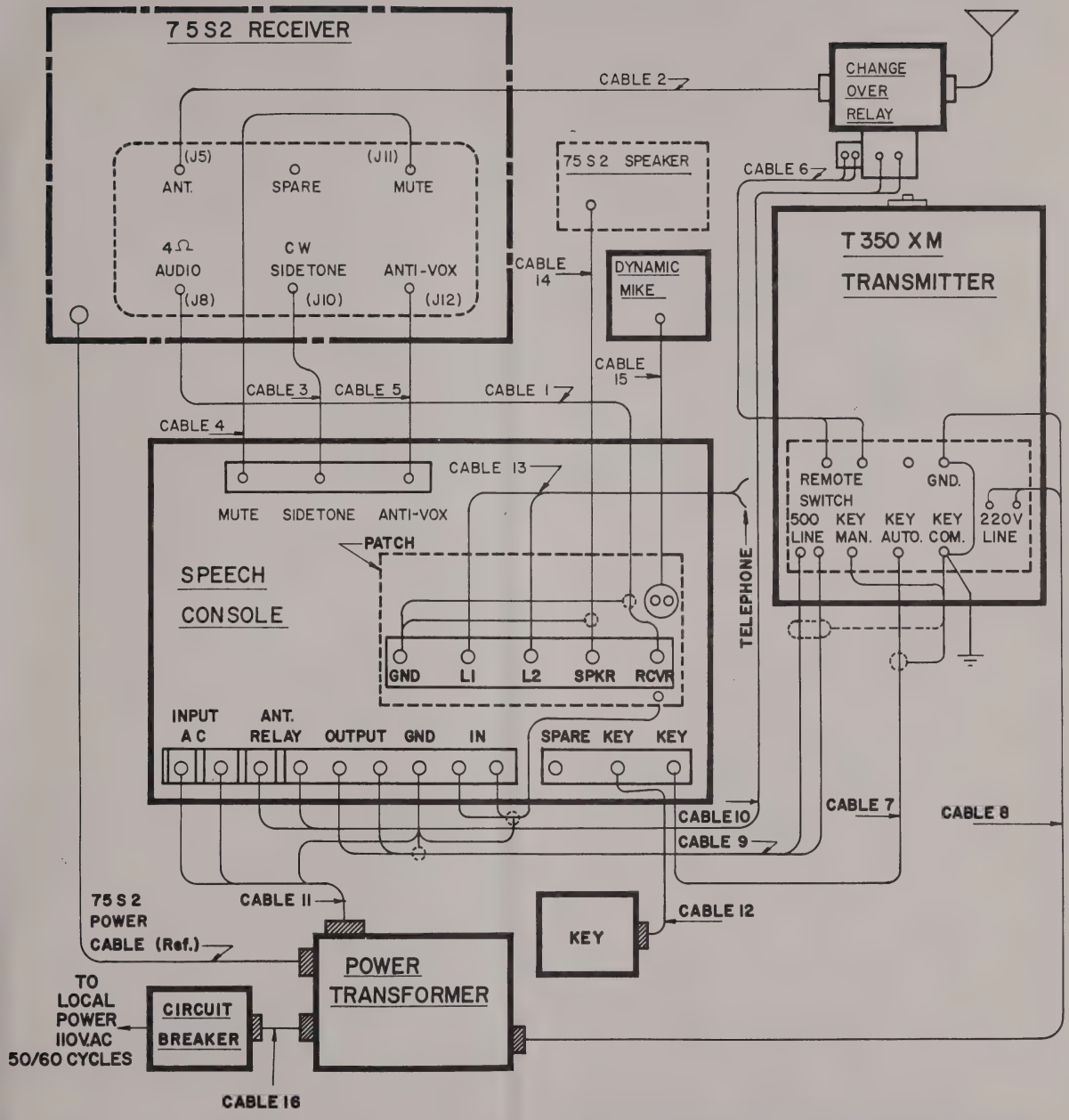
HIGH-LOW VOLTAGE POWER SUPPLIES AND CONTROL CIRCUITS

BLOCK DIAGRAM

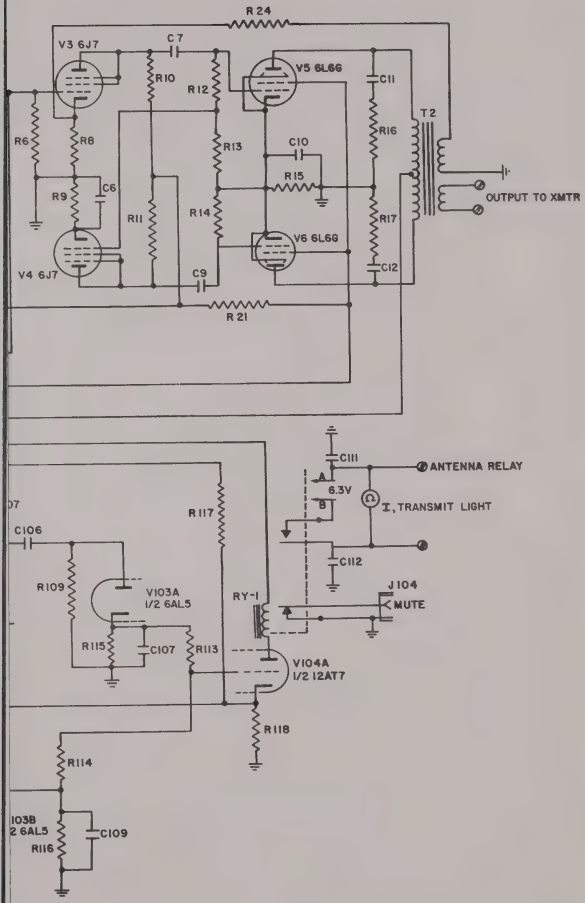
T350XM TRANSMITTER




TO
110 VOLTS A.C.
20 AMPS
CIRCUIT
BREAKER
BOX
SPEECH
CONSOLE 10
BLACK
RED / GREEN
WHITE
7552
RECEIVER
110 V
200 V
POWER
TRANSFORMER
220 V
240 V
TRANSMITTER 20
OUTPUT
200
220
240
COMMON
GND.
TERMINAL BOARD
AUTODYNE ENG. & MFG. CO.
BETHPAGE, NEW YORK

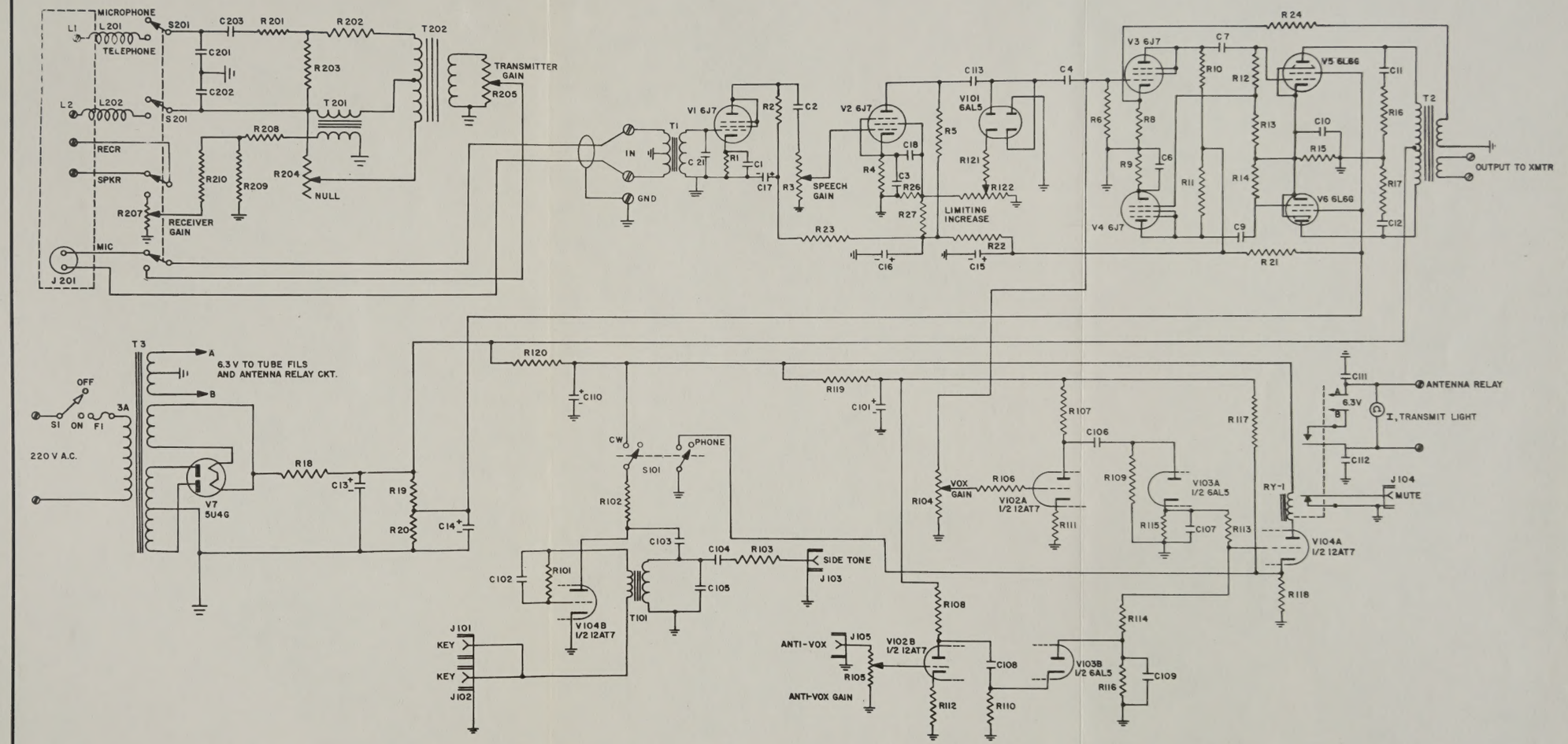


T-350XM TRANSMITTER SYSTEM
CABLING DIAGRAM



SCHEMATIC — SPEECH CONSOLE including
PHONE PATCH, VOX, ANTI-VOX, LIMITER & SIDETONE UNITS
for
T 350XM TRANSMITTER SYSTEM

UTODYNE ENGINEERING & MANUFACTURING CO.
BETHPAGE, N.Y.



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T 350XM TRANSMITTER SYSTEM

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